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Mr Warwick Anderson
General Manager
Network Finance and Reporting
Australian Energy Regulator
GPO Box 520, Melbourne Vic 3001

Lodged by email

11 March 2022

Dear Mr Anderson

**APA submission on the Rate of Return Information Paper, Omnibus Paper, and Expert Evidence**

Thank you for the opportunity to comment on:

- the *Rate of Return Information Paper* which the Australian Energy Regulator published in December 2021 (Information Paper);
- the *Overall Rate of Return, Equity and Debt Omnibus* paper which the Australian Energy Regulator published in December 2021 (Omnibus Paper); and
- the Concurrent Expert Evidence Sessions which were held on 10 February 2022 and 17 February 2022.

APA is an ASX listed owner, operator, and developer of energy infrastructure assets across Australia. Through a diverse portfolio of assets, we provide energy to customers in every state and territory on mainland Australia. As well as an extensive network of natural gas pipelines, we own or have interests in gas storage and generation facilities, electricity transmission networks, and over $750 million in renewable generation.

APA's submission is attached for your consideration.

This submission does not contain confidential information and may be published by the Australian Energy Regulator.

If you wish to discuss our submission in further detail, please contact Ignatius Chin on [redacted]

Sincerely,

always powering ahead

**Peter Bolding**

General Manager Economic Regulatory and External Policy

# APA submission on rate of return: Information Paper, Omnibus Paper, and Expert Evidence

*11 March 2022*

# Executive summary

APA Group (APA), the owner and operator of regulated gas transmission pipelines and electricity transmission lines, will be affected by the Australian Energy Regulator's Rate of Return Instrument 2022. APA appreciates the opportunity, now provided by the AER, to comment on its December 2021 *Information Paper*, on the earlier *Rate of return: Overall rate of return, equity and debt omnibus, Final working paper*, and on issues raised during the February 2022 expert evidence sessions.

In this submission, APA addresses each of the 35 questions which the AER has asked in the *Information Paper*. Our responses are summarized immediately after each question. In each case, our reasons follow our response.

Our key messages are the following.

***There is no term for equity which might be matched to the regulatory period or to the underlying asset lives***

Estimation of the risk free rate of return for application of the CAPM should use extensively traded government bonds with the longest terms to maturity. Australian Government bonds with terms to maturity of 10 years continue to be extensively traded and should now be used to estimate the risk free rate. With over $50 billion of bonds with terms longer than 10 years on issue, consideration should also be given to using, in risk free rate estimation, Australian Government bonds with terms to maturity longer than 10 years.

If the CAPM is used to estimate the rate of return on equity, there is no term to be associated with the risk free rate and no term to be associated with the estimated rate of return on equity.

The risk free rate is a market parameter unrelated to any of the risky assets available in the market for financial assets; it does not have a five-year term derived from the regulatory period.

The term to maturity of the bonds used to estimate the risk free rate does not impart a term to the risk free rate, or to the rate of return on equity.

The lives of any underlying physical assets are outside the scope of the CAPM and are not relevant to application of the model.

***The implied superiority of the historical excess returns approach, which assumes constant expected excess returns, to other methods of estimating the MRP, including the dividend growth model, is not clear***

An answer to the question of whether the dividend growth model is likely to be a better estimator than the historical excess returns approach requires an assessment of both ways of estimating the forward looking MRP.

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The limitations of the dividend growth model when applied to the regulatory task have been examined in the current rate of return review and in earlier reviews.

The current rate of return review has drawn attention to a growing body of evidence that expected excess returns are time varying. In these circumstances, the implied superiority of the historical excess returns approach, which assumes constant expected excess returns, to other methods including the dividend growth model, is not clear.

Expert evidence provided during the current review indicated that the time variation of expected returns was not well understood. There is, currently, no model of time varying excess returns which might replace the use of historical excess returns.

The experts advised that, at present, estimation of a forward looking MRP should use both the historical excess returns approach and the dividend growth model.

APA concurs with this advice.

***Dividend growth model estimates of the MRP should be used alongside the arithmetic mean of historical excess returns***

The appropriate estimator for estimation of the MRP from historical excess returns is the arithmetic mean. It is not the geometric mean.

The options for MRP estimation reduce to two:

- use of the arithmetic mean of excess returns; and
- dividend growth model estimates used alongside using the arithmetic mean of historical excess returns.

Use of dividend growth model estimates alongside the arithmetic mean of historical excess returns should lead to better estimates of the MRP.

The historical excess returns approach and the dividend growth model are different ways of estimating the forward looking MRP. There is no reason to confine dividend growth model estimates to a range set primarily by reference to historical excess returns. Dividend growth model estimates should not be confined in this way.

***Equity beta estimation***

APA does not agree with the AER's preliminary position of maintaining the current approach to estimation of equity betas.

Placing most weight on the longest periods of estimation is inappropriate when the circumstances of electricity network and gas pipeline service providers are undergoing long-term changes.

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These changes are, we think, the reason why there appears to be a difference between the betas for Australian electricity network and gas pipeline service providers. Further examination of that difference will require recourse to data from international comparators.

There is currently little to be learned, for beta estimation, from data for other (non-energy) Australian infrastructure businesses, or from the decisions of other regulators.

The best we can do at present is to make estimates of beta using the most recent five years of data.

***The Energy Industry Credit Spread Index, and the associated weighted average term to maturity index, should not be used to inform the return on debt***

The AER's Energy Industry Credit Spread Index (EISCI), and the associated weighted average term to maturity index, are calculated from data for a small number of quite different businesses. They cannot be regarded as indicators of an industry credit spread and term to maturity which might be used in estimating the rate of return on debt. They should not be used.

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# AER questions and APA responses

## Term of the rate of return

***1. Should the same principle ("NPV = 0") be used to assess the term for the return on equity and the term for expected inflation (now 5 years)?***

The NPV = 0 principle is not relevant to assessing the term for the return on equity component of the allowed rate of return when the rate of return on equity is estimated using the Capital Asset Pricing Model.

APA is of the view that there are conceptual errors in reasoning, via the NPV = 0 principle, which leads to the conclusion that a rate of return on equity estimated using the Sharpe-Lintner Capital Asset Pricing Model (CAPM) has a term. These conceptual errors do not invalidate the NPV = 0 principle, or its application in the assessment of the term for expected inflation. Rather, the principle is simply not relevant to assessing the term for the return on equity component of the allowed rate of return when the rate of return on equity is estimated using the CAPM.

APA explains why in its response to Question 2.

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## 2. *Should the term for equity match the regulatory period or the underlying asset lives?*

If the CAPM is used to estimate the return on equity component of the allowed rate of return, there is no term to be associated with the risk free rate and no term to be associated with the estimated rate of return on equity.

The risk free rate is a market parameter unrelated to any of the risky assets available in the market for financial assets; it does not have five-year term derived from the regulatory period.

The term to maturity of the bonds used to estimate the risk free rate does not impart a term to the risk free rate, or to the rate of return on equity.

The lives of any underlying physical assets are outside the scope of the CAPM and are not relevant to application of the model.

Estimation of the risk free rate of return for application of the CAPM should use extensively traded government bonds with the longest terms to maturity. Australian Government bonds with terms to maturity of 10 years continue to be extensively traded and should now be used to estimate the risk free rate, rather than bonds with terms of five years. With over $50 billion of bonds with terms longer than 10 years on issue, consideration should also be given to using, in risk free rate estimation, Australian Government bonds with terms to maturity longer than 10 years.

APA has contributed preparation of the rate of return submission from the Australian Pipeline and Gas Association (APGA). In that submission, we contend that the relevant cash flows are those over a period longer than five years, and that a restricted application of the NPV = 0 principle to a period of five years leads to an incorrect conclusion that the term for equity should match the regulatory period.

The reasons given in the APGA submission for the incorrect conclusion that the term for equity should match the regulatory period are, as we said, based on cash flows. There are, however, also reasons for rejecting the view that the term for equity should match the regulatory period which are based on consideration of the discount rate to be used in applying the NPV = 0 principle, and which are unrelated to issues about cash flows.

These reasons based on the discount rate, rather than on cash flows, are set out in the following paragraphs.

Our starting point is use of the CAPM to estimate the rate of return on equity. We are puzzled about why the AER and others might think that a financial market parameter in the CAPM - the risk free rate - should be estimated by reference to the particular institutional arrangements pertaining to just one small class of financial

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assets, the equity in regulated electricity network and gas pipeline service providers. We see a conceptual error in reasoning, via the NPV = 0 principle, which concludes that a rate of return on equity estimated using the CAPM has a term which should then be matched to the regulatory period.

Our reasons for this view are based on our understanding of the CAPM, which we set out in some detail in the paragraphs which follow. That understanding also leads us to conclude that, even if the estimated rate of return on equity were to have a term (it does not), that term could not be the lives of the underlying assets.

A succinct but careful application of the NPV = 0 principle to assessment of the term for the rate of return on equity can be found in Dr Martin Lally's paper, *The Appropriate Term for the Allowed Cost of Capital*, prepared for the Australian Energy Regulator (AER) in April 2021. We set out, below, Dr Lally's argument for the purpose of making clear the conceptual error which, we think, leads to the (incorrect) conclusions that the rate of return on equity has a term and the term should be the regulatory period.

We note that this conceptual error does not invalidate the NPV = 0 principle. However, the question of how the risk free rate of the CAPM is to be estimated is left open. Our response concludes with an answer to that question.

***The CAPM***

The CAPM is a simple model of financial market equilibrium in an exchange economy.

Underlying the CAPM is a view of agents - investors - buying and selling financial assets to form portfolios which will transfer wealth to a time one period in the future. The assets in question are no more than one-period claims to future income. The ways in which this income is generated are not specified. There is no production of goods and services, and no distribution of those goods and services, in the CAPM. There is no physical capital. There is no supply of new assets and, in consequence, there is no adjustment of portfolios to accommodate new supply.

In equilibrium in this economy, the expected rate of return on any particular asset is the sum of the rate of return on a risk free asset, and a premium for risk. This is the CAPM. The premium for risk is the product of the beta for the asset in question and the market risk premium (MRP). The MRP is the difference between the expected rate of return on the portfolio of assets held by all investors in the economy (held by "the market") and the rate of return on the risk free asset.

Each investor chooses a portfolio from all of the risky assets available in the market. Given a target expected rate of return, a rational investor will choose weights for the assets in her or his portfolio so that, overall, the portfolio has minimum variance of returns (each investor chooses a portfolio on the "portfolio frontier"). Furthermore, if

each investor's utility is an increasing and strictly concave function of expected return and variance of return, as is usually assumed for portfolio theory, the investor will choose only those weights which are for a portfolio represented by a point in the space of return variance and expected return which is on the portfolio frontier above and to the right of the point of minimum portfolio variance.[1] Each investor will choose only a "mean-variance efficient" portfolio.

Portfolio theory, as outlined in the preceding paragraph, addresses only the question of how investors best allocate the wealth with which they are initially endowed among the risky financial assets available in the market. It is not a theory of asset market equilibrium and asset pricing. Portfolio theory must be augmented if an explanation is to be provided for the prices at which particular assets are traded or, equivalently, for the rates of return on those assets.

As Sharpe, Lintner and others have shown, an asset market equilibrium can be identified from this view of investors buying and selling assets to form portfolios if one of the assets available to those investors is a risk free asset.

When the risk free asset is added to the set of risky assets from which investors form portfolios, every investor will choose, to maximize her or his utility, a portfolio which is a linear combination of the risk free asset and the market portfolio. This establishes asset market equilibrium in which the expected rate of return on any particular risky asset is the sum of the risk free rate of return and the contribution which that particular asset makes to the total risk of the market portfolio. A risky asset's contribution to the total risk of the market portfolio is the product of its beta and the MRP, where beta is the covariance of the return on the asset with the return on the market divided by the variance of the return on the market. In asset market equilibrium, the expected rate of return on any particular risky asset is given by the CAPM.[2]

The risk free asset of the CAPM is, then, a riskless asset available to all investors. It is an asset quite independent of any of the risky assets available for portfolio formation, including (risky) regulated infrastructure assets.

The riskless asset provides a riskless return. By definition, the riskless rate of return - the risk free rate - does not vary over the single period of the CAPM and does not vary across states of nature (the asset in question is riskless). The return on the risk free asset does not have a term structure which might the be imparted to an expected rate of return on equity determined using the CAPM.

APA is aware that others have argued, in the context of setting rates of return for regulated businesses, that application of the NPV = 0 principle to the cash flows of

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1 The portfolio frontier is a parabola in the space of return variance and expected return.

2 Chi-fu Huang and Robert H Litzenberger (1988), *Foundations for Financial Economics*, New York: Elsevier, provides a comprehensive textbook presentation of portfolio theory and CAPM derivation

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the business requires the term of the risk free rate, and hence the term of the estimated rate of return on equity, to be the regulatory period, which is typically five years. These arguments, we think, are invalid. Before we explain why, we note one further implication of the view underlying the CAPM that investors buy and sell financial assets to form portfolios which are used to transfer wealth over time.

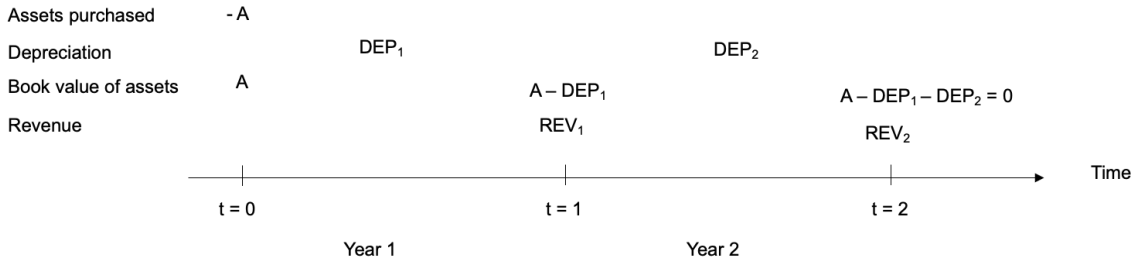
The assets of the CAPM are no more than one period claims to future income. As we noted above, the ways in which this income is generated are not specified. There is no production of goods and services and no distribution of those goods and services. There is no physical capital. The lives of the physical assets used in income generation are outside the scope of the CAPM and are, therefore, not relevant to the model's application. This is not to say the underlying asset lives are unimportant, but extension of the economic modelling of asset pricing to production economies, with the accumulation of physical capital, leads to asset pricing models which are much more complex than the CAPM. We are not aware of the use of such models in the setting of regulated rates of return.

If there were a term for the return on equity estimated using the CAPM (there is not), that term would not be the underlying - physical - asset lives.

***Application of the NPV = 0 principle***

Application of the NPV = 0 principle proceeds as follows. Regulated assets are purchased at time t = 0 and the purchase price is A. These assets have a life of two years, and the services they provide are subject to price regulation. The regulatory period is one year, and prices are set at the beginning of each regulatory period. Revenues are received at the end of each year. There are no operating expenditures, no new capital expenditures and no taxes.

The timing of cash flows and the book value of the assets over their life are shown in the following diagram.




The initial regulated asset value is A, and regulatory depreciation in Year 1 is $DEP_1$. Regulatory depreciation in Year 2, the last year of asset life, is $DEP_2 = A - DEP_1$. The book value of assets at time t = 2 is, then, zero.

At time t = 1, regulated prices are set to yield revenue $REV_2$. Those prices should provide the service provider with the opportunity to recover, in Year 2, depreciation

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in that year, and the allowed cost of capital ($k_1$) applied to the book value of assets at the beginning of the year (at t = 1):

$REV_2 = A - DEP_1 + k_1(A - DEP_1) = (A - DEP_1)(1 + k_1)$

$V_1$, the value of the regulated assets at time t = 1, is the future revenue ($REV_2$) discounted one year at the one year cost of equity at t = 1, $k_{e12}$:

$$V_1 = \frac{(A - DEP_1)(1 + k_1)}{1 + k_{e12}}$$

At time t = 0, regulated prices are set to yield revenue $REV_1$ at the end of Year 1. Those prices should provide the service provider with the opportunity to recover, in Year 1, depreciation in that year, and the allowed cost of capital ($k_0$) applied to the book value of assets at the beginning of the year (at t = 0):

$REV_1 = DEP_1 + k_0A$

The value of the regulated assets at time t = 0, $V_0$, is the revenue at the end of Year 1 ($REV_1$), plus the value of the regulated assets at time t = 1 ($V_1$), discounted one year at the one year cost of equity at t = 0, $k_{e01}$:

$$V_0 = \frac{DEP_1 + k_0A + V_1}{1 + k_{e01}} = \frac{1}{1 + k_{e01}}\left[DEP_1 + k_0A + \frac{(A - DEP_1)(1 + k_1)}{1 + k_{e12}}\right]$$

The NPV = 0 principle requires that the value of the regulated assets at time t = 0 be equal to the value of the regulated asset base at that time: it requires $V_0 = A$.

By inspection of the equation above for $V_0$, this can only be the case if:

- the allowed cost of capital, $k_1$, in Year 2 matches the discount rate $k_{e12}$ in that year (the cost of equity at t = 1); and
- the allowed cost of capital, $k_0$, in Year 1 matches the discount rate $k_{e01}$ in that year (the cost of equity at t = 0).

In the context of the model outlined above, the NPV = 0 principle requires that the allowed cost of capital in each year be equal to the one year cost of equity in that year.

Now, the cost of equity is to be estimated using the CAPM. In the context of the model, according to Dr Lally, the one year cost of equity is the risk free rate plus the product of the market risk premium and the beta, all defined over the one year period in question.

Dr Lally then generalizes the argument on pages 21 and 22 of his paper (*The Appropriate Term for the Allowed Cost of Capital*). He notes:

*By definition, the cost of equity capital is forward looking. If equity finance is raised at time 0, the cost at that time is the set of expected rates of return, one for each of*

*the time spans from 0 to the realization of future cash flows that the firm will receive. If the business is regulated with a cycle of five years, the relevant set of expectations are those for each of the next five years, which can be. compressed into a single expectation within which the risk free rate component is that on a bond with a five year term to maturity and a coupon rate matching the ratio of regulatory cash flows per year to the current regulatory asset base. As time moves forward, the set of expected rates of return changes, as each is now defined from the new current time until the realization of future cash flows. So, in five years' time, the relevant expectations are from then until the end of that regulatory cycle.*

We do not disagree with the conclusion that, if the business is regulated over a cycle of five years, the set of expectations relevant in the context of rate of return setting are those for each of the next five years.

Our concern is with the subsequent assertion that the relevant set of expectations can be compressed into a single expectation within which the risk free rate component is a bond with a five year term to maturity and a coupon rate matching the ratio of the regulatory cash flows per year to the current regulatory asset base. At this point in the argument, the term to maturity of the bond used to estimate the risk free rate of the CAPM is assumed to impart a term to the risk free rate and to the estimated cost of equity.

This, in our view, is conceptually incorrect.

As we explained above:

- the risk free asset of the CAPM is the riskless asset available to all investors; it is an asset quite independent of any of the risky assets available to those investors for portfolio formation, including (risky) regulated infrastructure assets;
- the riskless asset provides a riskless return, a rate of return - the risk free rate - which does not vary over the single period of the CAPM, and does not vary across states of nature; and
- the rate of return on the risk free asset does not have a term structure, which might be imparted to the expected rate of return on equity determined using the CAPM.

If the CAPM is to be used to estimate the cost of equity, then an estimate must be made of the risk free rate. CAPM application does not call for substitution of a low risk - but still risky - asset (a government bond) for the risk free asset of the model. To substitute a low risk asset for the risk free asset, in the way implied by the assumption made explicit by Dr Lally, would be inconsistent with the underlying economic theory of the CAPM.

***Professor Davis has also used NPV = 0 to establish the term of the risk free rate***

In a report for the Australian Competition and Consumer Commission, in 2003, Professor Kevin Davis also advised that, when applying the CAPM in the context of economic regulation, the term to maturity of the bonds used to estimate the risk free

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rate should match the regulatory period.[3] Again, the supporting argument was that, by setting the term equal to the regulatory period (five years), the NPV = 0 principle was satisfied. Unfortunately, Professor Davis's supporting argument was flawed.

Professor Davis, in effect, set out a necessary condition for NPV = 0: the number used as the estimate the risk free rate of the CAPM must be the same as the number used for the risk free rate in a portfolio tracking investment in the regulated asset. This necessary condition was not, however, sufficient to characterise the risk free asset and the risk free rate.

If the risk free rate of the rate of the CAPM were to be estimated using government bonds with terms to maturity of 10 years, or of 20 years, and bonds of the same term to maturity were used in determining the return on Professor Davis's tracking portfolio, the NPV = 0 principle would still be satisfied. In Professor Davis's 2003 analysis, the term of the bond to be used to estimate the risk free rate is indeterminate.

In subsequent, similar, work - a report for New South Wales Independent Pricing and Regulatory Tribunal (IPART) in 2011, and a working paper (2012) - Professor Davis did not refer to the issue of the term to maturity of the risk free asset.[4] He addressed only the assumption to be made about the term to maturity of the debt issued by the regulated firm when determining regulated access prices. When the working paper was published in the *Economic Record*, in September 2014, Professor Davis did not address the question of whether the use of yields on bonds with terms to maturity of 10 years, or on bonds with any other term to maturity, was appropriate for estimation of the risk free rate of return.[5]

The use of yields on bonds with term to maturity equal to the regulatory period (typically, five years) has purportedly been justified by a requirement that the NPV = 0 principle is satisfied. However, such justifications, as we have explained, are based either on an invalid assumption (Dr Lally's assumption about expectations), or on models (like those of Professor Davis) which leave the term of the bonds to be used to estimate the risk free rate indeterminate.

Irrespective of the term of the bond used to estimate the risk free rate, the risk free rate itself, as used in the CAPM, has no term which is imparted to the resulting estimate of the cost of equity. If the CAPM is used and, consistent with the assumptions of the model, no term is assigned to the resulting estimate of the cost of

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3 Kevin Davis, *Report on "Risk Free Interest Rate and Equity and Debt Beta Determination in the WACC"*, August 2003, page 4.

4 Kevin Davis, *Determining Debt Costs in Access Pricing: A Report to IPART*, Appendix A to IPART, *Developing the approach to estimating the debt margin, Other Industries - Draft Decision*, February 2011; and Kevin Davis, *The debt Maturity Issue in Access Pricing*, Draft 3, 2 September 2012.

5 Kevin Davis (2014), "The Debt Maturity Issue in Access Pricing," Economic Record, 90(290), pages 271-281.

equity, the NPV = 0 principle is not violated: NPV continues to be zero. However, the question of how the risk free rate is to be estimated is left open.

***How, then, is the risk free rate of the CAPM to be estimated?***

The risk free asset is a theoretical construct, and any estimate of the risk free rate must be made from the rates of return on traded assets for which returns can be observed. No traded asset is risk free, although investors view some assets as having significantly less risk than others.

Which assets, among all of the assets traded, do investors (all investors, and not just those investing in regulated infrastructure assets) regard as being close to risk free?

Extensively traded financial assets - bonds - issued by reputable government borrowers are generally regarded as low risk among all traded assets.

Now, investors do not desire, for its own sake, the wealth which is transferred through time via asset portfolios. Wealth is desired for the consumption of goods and services which it makes possible. A risk averse investor will choose a stable consumption plan but will be unable to realise that plan by transferring wealth over time using a series of bonds with short terms to maturity. Although a bond with a short term may be close to riskless over its term to maturity, transferring wealth over longer horizons by rolling over short bonds is risky because future bond yields are uncertain and time-varying. Facing uncertain and time varying short-term yields, investors can finance relatively stable consumption plans with long term bonds.[6] The ideal bond for this purpose would be an inflation indexed bond without a maturity date - an inflation indexed "consol". Inflation indexed consols are, however, unusual, and may not be among the traded assets for which returns can be observed. In practice, risk free rate estimation must be confined to extensively traded bonds with the longest terms to maturity.

Returns on extensively traded government bonds with the longest terms to maturity should be used in estimation of the risk free rate for CAPM application.

The AER has previously used yields on Australian Government bonds with terms to maturity of 10 years to estimate the risk free rate.

To now use yields on bonds with terms to maturity of around five years is likely to produce a downward-biased estimate of the risk free rate.

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[6] That long term bonds rather than short term bonds were relevant to consideration of the risk free asset appears to have been first raised by Franco Modigliani and Richard Sutch (1966), "Innovations in Interest Rate Policy", American Economic Review, 56(1/2), pages 178-197. The argument was subsequent developed by, among others, Joseph E Stiglitz (1970), "A Consumption-Oriented Theory of the Demand for Financial Assets and the Term Structure of Interest Rates", Review of Economic Studies, 37(3), pages 321-351; John Y Campbell and Luis M Viceira (2001), "Who Should Buy Long Term Bonds?", American Economic Review, 91(1), pages 99-127; and Jessica A. Wachter (2003), "Risk aversion and allocation to long term bonds", Journal of Economic Theory, 112, pages 325-333.

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Risk free rate estimation should, at least, continue to use the yields on Australian Government bonds with terms to maturity of 10 years.

However, the Australian Office of Financial Management has indicated, in its January 2022 Mid-Year Economic and Fiscal Outlook update, that, of the $778 billion of Australian Government bonds on issue, some $93.6 billion had maturities around five years, $144.1 billion had maturities around 10 years, and a further $36.2 billion had maturities around 20 years. An issue of $15.6 billion matured in June 2051.

With over $50 billion of bonds with terms longer than 10 years now on issue, consideration should also be given to using, in risk free rate estimation, Australian Government bonds with terms to maturity longer than 10 years.

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### 3. *Should the AER's Energy Industry Credit Spread Index (EISCI), and the associated weighted average term to maturity index, be used to inform the return on debt?*

The AER's Energy Industry Credit Spread Index (EISCI), and the associated weighted average term to maturity index, are calculated from data for a small number of businesses and cannot be regarded as indicators of an industry term to maturity, and a return on debt which might be used in applying economic regulation.

The EICSI and the associated weighted average term to maturity index should not be used to inform the return on debt.

The cost of debt, as APA has advised in earlier submissions, varies between the service providers whose debt costs are used to calculate the EISCI. This is not because those service providers are inefficient in debt raising, but because lenders recognise and price in their loan agreements firm-specific risks. Loan agreements and the pricing of debt for small businesses are standardised. For larger businesses - for electricity network and gas pipeline service providers - the negotiation of loan agreements involves prospective lenders examining the business and its contractual arrangements (for inputs, including finance, and for outputs) to ascertain risks and to determine the way in which these risks are allocated and managed. The EISCI simply averages the different firm-specific risks which have been priced into the credit spreads of the small number of businesses from whom debt data have been obtained for index calculation.

Credit spreads differ, not because service providers fail to expend effort on minimising those spreads, but because the underlying risks of the businesses are different, lender assessments of those risks (based on specific inquiry, and not on reference to credit ratings) are different, and there are different options available for risk management. With different technologies (electricity transmission, electricity distribution, gas transmission and gas distribution), different scales of operation (electricity distribution businesses are often much larger than gas transmission and distribution businesses), different equity financing arrangements (private or publicly listed; and less directly, through public ownership), different gearing, and different market risks and different contracting arrangements (regulated and partly implicit contracts with large numbers of end users in the case of electricity and gas distribution, small numbers of explicitly contracted large end users in the case of gas transmission), credit spreads will be different. In their negotiation of loan agreements, lenders and service providers have considerable discretion in specifying cash flow rights, control rights, and other rights (for example, in relation to collateral and options), and in specifying the contingencies under which these rights are exercised. Again, credit spreads will differ.

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Each of the credit spreads which goes into the calculation of the EICSI represents an assessment of the credit risk of a particular service provider, by a particular lender or group of lenders, at the time debt is raised.

The EISCI is not, then, a benchmark which an efficient service provider can aspire to achieve. Its use would arbitrarily reward those service providers seen by lenders as lower firm-specific risks and would not provide those service providers with any incentive for lower debts costs. Use of the EISCI would penalise those service providers seen by lenders as being higher firm-specific risks and who, despite the "incentive", could not lower their debt costs to the level indicated by the index.

If the credit spread of the EISCI is not a benchmark to which service providers can aspire, then the associated weighted average term to maturity index is of little relevance in establishing a benchmark term to maturity for service provider debt.

We doubt whether, in the case of debt, benchmarking is feasible. However, if a benchmark cost of debt or benchmark credit spread is required for the implementation of incentive regulation, the starting point must be a large sample of similar issues. The set of electricity network and gas pipeline service providers from which the AER sources debt data for EISCI calculation is, in our view, both too diverse and too small. If the benchmark is based on a large sample, inefficiencies in debt raising (which we think are not material) will be "averaged out" as intended. More importantly, there will be averaging across a wide range of risks and across a wide range of contractual responses to risk management. This averaging across a wide range of risks and contractual responses will reduce, but not entirely eliminate, the problem that some businesses are seen by lenders as being inherently more risky than others.

If the AER is to continue to benchmark the cost of debt, it should do so using data from a large sample of similar issues, as it does at present using the RBA, Bloomberg and Thompson Reuters data. The EICSI and the associated weighted average term to maturity index should not be used to inform the return on debt.

In his presentation to the first of the AER's expert evidence sessions, Dr Lally again advised that that the difference between the EISCI estimate of credit spread and the spread obtained using the current method for cost of debt estimation should be decomposed into three components:

- a part due to debt term to maturity;
- a part due to credit rating; and
- a residual.

This decomposition effectively partitions the credit spread difference into a component related to term, a component related to risk, and a random variation. The risk component does no more than indicate the extent to which the average of the risks of the relatively small number of service providers who provide the data for

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EISCI calculation differs from the average of risks in the broader samples of the RBA, Bloomberg and Thompson Reuters data. The EISCI (and the associated term to maturity index) might be used to adjust for any difference in risk by resetting the weights on A-rated and BBB-rated bonds and for any difference in term. But, as Dr Lally advises, if these adjustments are to be made, the AER should be confident in its current EISCI data, and the data set should be sufficiently large. Dr Lally did not indicate whether he thought the data set was sufficient large. We do not think that it is.

During the experts' EISCI discussion, Dr Boyle questioned whether a difference between the EISCI estimate of credit spread and the spread obtained using the current method for cost of debt estimation really existed. The standard errors, he advised, could be quite high, and any observed difference may not be statistically significant. Dr Boyle was of the view that, until this issue was addressed, use of the EICSI could not progress.

Dr Boyle did not elaborate on why standard errors might be high, but one reason would be the diverse firm-specific risks in the small sample underpinning the EISCI.

Mr Kumareswaran also commented on the difference between the EISCI estimate of credit spread and the spread obtained using the current method for cost of debt estimation. He questioned whether the observed difference - outperformance against the cost of debt estimated using the current method - was a small sample problem arising from the small number of issues underlying the EISCI calculation.

In APA's view, the EISCI and the associated weighted average term to maturity index, are calculated from data for a small number of businesses and cannot be regarded as indicators of an industry term to maturity, and a return on debt which might be used in applying economic regulation. The EICSI and the associated weighted average term to maturity index should not be used to inform the return on debt.

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### 4. *If the AER were to change the term for the return on debt, how should this be implemented?*

APA cannot provide a view on how a change to the term assumed for return on debt estimation should be implemented.

There is, at present, little evidence to support a change in term from the current benchmark of 10 years.

APA's response to Question 4 follows from our detailed response to Question 3.

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## Estimation of the market risk premium

### 5. *Is the dividend growth model likely to be a better estimator of a forward looking MRP than the historical excess returns approach, and is it suited for application in the regulatory task?*

An answer to the question of whether the dividend growth model is likely to be a better estimator than the historical excess returns approach requires an assessment of both ways of estimating a forward looking MRP.

The limitations of the dividend growth model when applied to the regulatory task have been examined in the current rate of return review process and in earlier reviews.

The current rate of return review process has drawn attention to a growing body of evidence that expected excess returns are time varying. In these circumstances, the implied superiority of the historical excess returns approach, which assumes constant expected excess returns, to other methods including the dividend growth model, is not clear.

Expert evidence provided during the current review indicated that the time variation of expected returns was not well understood. There is, currently, no model of time varying excess returns which might replace the use of historical excess returns.

The experts advised that, at present, estimation of a forward looking MRP should use both the historical excess returns approach and the dividend growth model.

APA concurs with this advice.

Application of the CAPM requires an estimate of the MRP which is a forward-looking mean of the distribution of excess returns.

There has been a long tradition of using historical excess returns to estimate the MRP of the CAPM, and that tradition has become part of the approach to estimating allowed rates of return for regulated electricity network and gas pipeline service providers in Australia.

The Brattle Group, in a report on its review of international approaches to regulated rates of return, noted that the AER, like other reviewed regulators, relied on an MRP which was essentially backward-looking.[7] This, the report noted, had the advantage of making the parameter stable and predictable.

[7] The Brattle Group, *A Review of International Approaches to Regulated Rates of Return*, June 2020, page 53.

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The AER responded, in its August 2020 *CAPM and alternative return on equity models* draft working paper, advising that it did not consider its current estimate to be backward-looking: the AER estimated a forward-looking market risk premium within a forward-looking rate of return.[8] Reference was made, in the draft working paper, to further explanation in the December 2018 *Rate of Return Instrument Explanatory Statement*. In July 2021, the AER advised that the historical excess returns method had a number of desirable characteristics for estimating the MRP in a regulatory setting: the data were observable, the method was easily replicable, and the process was transparent. Moreover:

*Using historical excess returns does not mean our MRP estimate is backward looking. Historical excess return data is commonly used in both regulation, and by market practitioners to inform their estimates of the market risk premium within a forward looking rate of return.*[9]

We agree that the historical excess returns method uses observable data, is easily replicable, and is transparent. It is also commonly used by regulators, and by market practitioners, to inform their estimates of the MRP.

However, none of these factors explains why we should expect historical excess returns to provide us with an estimate of a forward looking MRP. Something is missing.

Missing from the discussion of the use of historical excess returns is the link between the future distribution of excess returns, the mean of which is the MRP, and the subsequent realizations of excess returns. Without that link, the relevance of historical excess returns to estimation of a forward looking MRP is unclear. Furthermore, in the absence of the link, there is no way of assessing whether the use of historical excess returns is superior (or inferior) to any other approach to estimating a forward looking MRP.

Professor John Campbell tells us that the use of historical excess returns has its origins in the efficient market hypothesis, which gained currency during the 1960s and 1970s.[10] A similar view is advanced by Professor John Cochrane.[11] One implication of the testing of the efficient market hypothesis was that the true MRP was constant. The efficient market hypothesis (Box 1) then provided the link between the mean of

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8 Australian Energy Regulator, *CAPM and alternative return on equity models: draft working paper*, August 2020, page 23.

9 Australian Energy Regulator, *Equity Omnibus: Draft working paper*, July 2021, page 4-22.

10 John Y Campbell, "Estimating the Equity Premium", National Bureau of Economic Research Working Paper 13423, September 2007.

11 John H Cochrane (2005), *Asset Pricing*, revised edition, Princeton, Princeton University Press, pages 389-391.

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the future distribution of excess returns and the use of historical returns to estimate that mean.[12]

***Box 1: Efficient market hypothesis and constant expected returns***

The efficient market hypothesis is the proposition that the information which market participants use, at any time, to determine the prices of financial assets is all of the information available at that time. This information which market participants currently use includes the implications of currently available information for the joint probability distributions of asset prices at future times. If $p_{t+\tau}$ is the vector of prices of all assets available in the market at time $t + \tau$ (including any interest or dividend payments at $t + \tau$), then the joint density function of prices at $t + \tau$, as assessed by market participants at $t - 1$ on the basis of the information in the set ${}^{m}\varphi_{t-1}$, is

$$f_m(p_{t+\tau} \mid {}^{m}\varphi_{t-1}), \tau = 0, 1, 2, \ldots .$$

Market efficiency implies that the set of information market participants use to determine asset prices at time $t - 1$ is the set $\varphi_{t-1}$ of all information relevant to determining prices at that time:

$${}^{m}\varphi_{t-1} = \varphi_{t-1},$$

Since $\varphi_{t-1}$ includes the implications of currently available information for the joint probability distributions of asset prices at future times, market participants understand the implications of currently available information (at time $t - 1$) for the future asset prices (at time $t$):

$$f_m(p_t \mid {}^{m}\varphi_{t-1}) = f(p_t \mid \varphi_{t-1}),$$

where $f$ is the true probability density function of asset prices implied by the information set $\varphi_{t-1}$. More specifically, given the information available at $t - 1$, market participants correctly assess the joint distribution of asset prices at time $t$.

If the assessment of the joint distribution of asset prices at time $t$ is used to determine equilibrium asset prices at time $t - 1$, market participants must have a model of how those $t - 1$ prices are determined from the market assessed joint distribution of prices at time $t$. A number of models have been proposed and testing of the efficient market hypothesis has commonly used a model in which expected returns are constant through time. (Tests of the efficient market hypothesis are then, simultaneously, tests of efficiency and of the model in which expected returns are constant through time.)

If market participants assess, at $t = 1$, the joint distribution of asset prices at time $t$, $f_m(p_t \mid {}^{m}\varphi_{t-1})$, this implies a distribution at $t - 1$, $f_m(p_{j\,t} \mid {}^{m}\varphi_{t-1})$, for the price of each asset $j$ at $t$. Let the mean of this distribution of the price of asset $j$ be $E_m(p_{j\,t} \mid {}^{m}\varphi_{t-1})$.

If expected returns are constant, at every time $t - 1$, the market sets the current price of financial asset $j$, $p_{j\,t-1}$, so that the expected return on the asset given its expected future price is the constant $E(R_j)$:

$$E_m(R_{j\,t} \mid {}^{m}\varphi_{t-1}) = \frac{E_m(p_{j\,t} \mid {}^{m}\varphi_{t-1}) - p_{j\,t-1}}{p_{j\,t-1}} = E(R_j)$$

If the market is efficient, and market participants use all of the information available to assess $f_m(p_t \mid {}^{m}\varphi_{t-1})$, then this assessed distribution is the true distribution $f(p_t \mid \varphi_{t-1})$. This implies:

$$E_m(p_{j\,t} \mid {}^{m}\varphi_{t-1}) = E(p_{j\,t} \mid \varphi_{t-1})$$

and

$$E_m(R_{j\,t} \mid {}^{m}\varphi_{t-1}) = E(R_{j\,t} \mid \varphi_{t-1}) = E(R_j).$$

[12] Eugene F Fama (1976), *Foundations of Finance*, New York: Basic Books, chapter 5. The explanation of the implications of the efficient market hypothesis in the paragraphs which follow is drawn from chapter 5 but, in that chapter, Fama's primary concern is testing of the hypothesis rather than its implications for estimation of the MRP.

***Box 1: Efficient market hypothesis and constant expected returns (continued)***

That is, market efficiency and constant expected returns imply:

- at time t - 1, market participants correctly assess the distribution of the price of any specified financial asset at time t;
- the expected value of the future price (the price at t) as assessed by market participants is the true expected value of that future price;
- when the market sets the prices of financial assets at t - 1, the assessment of expected return on any asset is the true expected return.

The efficient market hypothesis and the model of constant expected returns provide the rationale for using the mean of historical excess returns as an estimate of the expected excess return on the market: they provide the rationale for using historical excess returns to estimate the MRP.

Is, then, the dividend growth model likely to provide a better estimate of a forward looking MRP than the estimate obtained using historical excess returns? Answering this question requires much more than simply listing the deficiencies of the dividend growth model. It requires assessing the dividend growth model against an approach to MRP estimation which has its foundations in the efficient market hypothesis and the model of constant expected returns.

In 1980, estimation of the MRP from historical excess returns was described by Robert Merton as "state-of-the-art".[13] In 2014, in a revised and published version of his Nobel lecture, Eugene Fama observed:

*. . . early work on market efficiency generally assumes that equilibrium expected stock returns are constant through time. This is unlikely to be true. The expected return on a stock contains compensation for bearing the risk of the return. Both the risk and the willingness of investors to bear the risk are likely to change through time, leading to a time varying expected return. The trick is to find predetermined variables that can be used to track expected returns in forecasting regressions*.[14]

Research since 1980 has suggested that excess returns can be predicted by regressing those returns on lagged financial variables including valuation ratios (dividend-price ratios, earnings-price ratios, and smoothed earnings price ratios) and interest rates. This research draws into question the validity of the efficient market hypothesis and the constant expected returns model. However, its findings have been challenged on methodological and other grounds.

Surveying the literature in 2003, Goyal and Welch concluded that neither dividend yields nor dividend price ratios had both the in-sample and out-of-sample

[13] Robert C Merton (1980), "On Estimating the Expected Return on the Market: An Exploratory Investigation", Journal of Financial Economics, 8, page 327.

[14] Eugene F Fama (2014), "Two Pillars of Asset Pricing", American Economic Review, 104(6), page 1473.

performance that should have led to a belief that they could outperform the simple prevailing equity premium average in an economically or statistically significant manner.[15]

Goyal and Welch reviewed the literature again in 2008 and reported:

*Our article comprehensively reexamines the performance of variables that have been suggested by the academic literature to be good predictors of the equity premium. We find that by and large, these models have predicted poorly both in-sample (IS) and out-of-sample (OOS) for 30 years now; these models seem unstable, as diagnosed by their out-of-sample prediction and other statistics; and these models would not have helped an investor with access only to available information to profitably time the market.*[16]

In a working paper, Goyal, Welch and Zafirov report on an examination of 29 variables from 26 papers published after Goyal and Welch 2008, and on the 17 variables identified in the earlier paper as being useful in predicting the equity premium.[17] They find that most of the variables they examine have now lost their empirical support as predictors, a few seem to perform reasonably well, but overall the ability of models using these variables to predict the equity premium remains disappointing. (We note that the working paper appears to be at an early stage of preparation.)

The issues of returns predictability and time variation in returns were examined in a working paper for the Australian Competition and Consumer Commission (ACCC) and the Australian Energy Regulator (AER) prepared in 2013. In that paper, ACCC Principal Economist, Peter Gibbard, concluded from a review of the relevant research that the recent literature had developed a range of models that was increasingly diverse and complex. This diversity and complexity of models, many of which were difficult to implement, would make challenging evidence-based selection of a particular model by a regulator considering conditional models of the MRP. More recent studies, Gibbard advised, have found that the values of the parameters in returns models are unstable. How a regulator might, then, set the MRP as a function of some specific variable, and allow the MRP to be adjusted in response to movements in that variable, was unclear.

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15 Amit Goyal, Ivo Welch (2003), "Predicting the Equity Premium with Dividend Ratios", Management Science, 49(5), page 653.

16 Ivo Welch, Amit Goyal (2008), "A Comprehensive Look at The Empirical Performance of Equity Premium Prediction", Review of Financial Studies, 21(4), page 1455.

17 Amit Goyal, Ivo Welch, Athanasse Zafirov, "A Comprehensive Look at the Empirical Performance of Equity Premium Prediction II", Swiss Finance Institute Research Paper Series No 21-85, 23 September 2021.

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In 2022, the view that the MRP is constant can be questioned.[18] Discussion at the AER's third expert evidence session confirmed this. In the fourth session, Dr Boyle advised that the only way in which historical excess returns could be used is over a long period, after testing for ergodicity and stationarity. Dr Boyle did not elaborate, but a test for stationarity could be a test for, among other things, a constant expected excess return.

We understood the experts at the AER's third expert evidence session to be advising that what might replace constant MRP assumption is not, at the present, time clear. Multiple approaches to MRP estimation should, therefore, be considered.

The use of historical excess returns is one approach, but it has the limitations discussed above. Estimation using the dividend growth model is another approach, but with the limitations that have previously been recognised, and which were noted by Professor Partington in his presentation at the third expert evidence session.

Is the dividend growth model suited for application in the regulatory task?

We think that it is. The AER continues to provide dividend growth model estimates, the most recent of these being in its December 2021 *Rate of Return: Annual Update*. Energy Networks Australia has developed an implementable version of the dividend growth model in which some specific earlier objections to the model have been addressed.

There was, in the third expert evidence session, considerable agreement among experts that the dividend growth model should be used, by the AER, as part its approach to MRP estimation.

We agree.

[18] See Australian Energy Regulator, *Overall rate of return, equity and debt omnibus: Final working paper*, December 2021, page 34.

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### 6. *Is the use of both historical excess returns and the dividend growth model likely to provide a better estimate of the forward-looking MRP?*

The use of both historical excess returns and the dividend growth model is likely to provide a better estimate of the forward-looking MRP.

The historical excess returns approach and the dividend growth model are different ways of estimating the forward looking MRP: there is no reason to confine dividend growth model estimates to a range set primarily by reference to historical excess returns (the second of the AER's three potential options). Dividend growth model estimates should not be confined in this way.

See APA's response to Question 5.

The dividend growth model and the use of historical excess returns are fundamentally different ways of estimating the market risk premium.

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### 7. *Can use of the Energy Networks Australia calibrated dividend growth model address the AER's previous concerns about the dividend growth model?*

As our responses to Questions 5 and 6 make clear, for MRP estimation the dividend growth model is an alternative to the historical excess returns approach.

The Energy Networks Australia calibrated dividend growth model addresses a number of the AER's previous concerns about the dividend growth model and can be used in MRP estimation.

APA supports the work of Energy Networks Australia to develop a form of the dividend growth model which can be implemented in a way which can address AER concerns, and which is it suited for application in the regulatory task.

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### 8. *Is there a reliable way to estimate changes in the market risk premium through time?*

APA is unaware of any reliable way to estimate changes in the market risk premium through time.

APA's is of the view that there is no reliable way to estimate changes in the market risk premium through time.

We understood the experts, at the third of the AER's expert evidence sessions, to have similar views: the market risk premium was time varying, but there was no accepted way of estimating changes in the premium through time.

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### 9. *Is the market practice of using a modified risk free rate to estimate a longer term MRP suitable for the AER's regulatory task?*

Any market practice of using a modified risk free rate to estimate a longer term MRP is unlikely to be suitable for the AER's regulatory task.

APA's capital markets group advised that they were unsure about whether there was a specific "market practice" involving use of a modified risk free rate to estimate a longer term MRP. They were aware that some practitioners used methods of estimation of the risk free rate which were different from the standard method, which is the method now used for regulatory purposes. They were concerned that this gave the "designer" of those non-standard methods licence to decide what estimate they wanted.

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***10. Which of the three proposed options (arithmetic and geometric means of historical excess returns; use of dividend growth model to estimate an MRP within the range observed using the arithmetic and geometric means of historical excess returns; dividend growth model estimates used alongside using the arithmetic and geometric means of historical excess returns) would lead to the better estimate of MRP for regulatory purposes?***

The appropriate estimator for estimation of the MRP from historical excess returns is the arithmetic mean. It is not the geometric mean.

The options for MRP estimation reduce to two:

- **use of the arithmetic mean of historical excess returns; and**
- **dividend growth model estimates used alongside using the arithmetic mean of historical excess returns.**

APA is of the view that dividend growth model estimates used alongside using the arithmetic mean of historical excess returns should lead to better estimates of the MRP.

Each of the three options which the AER has proposed for MRP estimation includes the use of arithmetic and geometric means of excess returns. However, for the reasons set out below, the geometric mean has no role to play, and the options for MRP estimation reduce to two:

- **use of the arithmetic mean of historical excess returns; and**
- **dividend growth model estimates used alongside using the arithmetic mean of historical excess returns.**

APA responses to the AER's Questions 5, 6, 7 and 8 support our view that dividend growth model estimates used alongside using the arithmetic mean of historical excess returns should lead to better estimates of the MRP.

In the paragraphs which follow, we set out the reasons why the appropriate estimator for estimation of the MRP from historical excess returns is the arithmetic mean. It is not the geometric mean.

***Arithmetic versus geometric mean***

If the appropriate estimator is the arithmetic mean, why, then, are both the arithmetic mean and the geometric mean often reported when estimates of the MRP have been made from long series of historical excess returns (as, for example, in the work of Dimson, Marsh and Staunton[19])? The answer is provided in a series of reports prepared for the Office of Gas and Electricity Markets (Ofgem) in the United

[19] See, for example, Elroy Dimson, Paul Marsh, Mike Staunton (2002), *Triumph of the Optimists: 101 Years of Global Investment Returns*, Princeton: Princeton University Press.

Kingdom. In 2003, Professors Stephen Wright, Robin Mason and David Miles, advised Ofgem that:

*Standard theory requires that the appropriate measure of any given return used in determining the cost of capital should be $E(R_{jt})$, i.e. the true arithmetic mean. This requirement holds whatever the nature of the process that generates $R_{jt}$.*[20]

Wright, Mason and Miles noted, however, that historical studies frequently quoted two closely related measures: an arithmetic mean and a geometric mean. The rationale for this, they advised, was the very common assumption that returns on financial assets are log-normally distributed rather than normally distributed. Use of the log-normal distribution, among other things, allowed skewness in the distribution of returns to be taken into account, and appropriately truncated the support of the distribution by ruling out returns less than -100%, recognising that most financial assets have the attribute of limited liability, and the largest loss that could be realised was the investor's total investment.

The assumption of log-normality means that the (natural) logarithm of returns, $r_{jt}$,

$$r_{jt} = \log(1 + R_{jt}),$$

is normally distributed with mean $E(r_{jt})$ and standard deviation $\sigma(r_{jt})$. $R_{jt}$ is the return on the financial asset in question defined in the usual way:

$$R_{jt} = \frac{P_{jt} + D_{jt}}{P_{j\,t-1}} - 1$$

where $P_j$ is the price of the asset, and $D_j$ is any dividend.

The properties of the log-normal distribution function imply:

$$1 + E(R_{jt}) = \exp\left(E(r_{jt}) + \frac{\sigma^2(r_{jt})}{2}\right)$$

Approximating, using the first two terms of the power series for exp(x):

$$E(R_{jt}) \approx E(r_{jt}) + \frac{\sigma^2(r_{jt})}{2}$$

Define $G(R_{jt})$ as:

$$1 + G(R_{jt}) = \exp(E(r_{jt}))$$

[20] Stephen Wright, Robin Mason, David Miles, *A Study into Certain Aspects of the Cost of Capital for Regulated Utilities in the U.K.*, 13 February 2003, page 24. See also Stephen Wright, Robin Mason, Steve Satchell, Kenjiro Hori, Meltem Baskaya, *Report on the Cost of Capital provided to Ofgem*, 1 September 2006;

$G(R_{jt})$ is, approximately, the geometric mean defined as the compound - geometric - average of $(1 + R_{jt})$ minus 1. $G(R_{jt})$ is, effectively, the geometric mean of the returns $R_{jt}$. Approximating, again, using the first two terms of the power series for exp(x):

$$G(R_{jt}) \approx E(r_{jt})$$

so that

$$E(R_{jt}) \approx G(R_{jt}) + \frac{\sigma^2(r_{jt})}{2}$$

That is, the arithmetic mean of returns assumed to be log-normally distributed is approximately equal to the sum of the geometric mean of those returns plus one half of the variance of the log-returns.

The arithmetic mean required for estimation of expected returns when applying models like the CAPM can be estimated as the geometric mean plus an adjustment for the difference between the two means. This adjustment is for the volatility in log-returns.

We note that the AER has recently advised that both the arithmetic mean and the geometric mean should be considered when estimating the forward looking MRP using historical excess returns. The best estimate of historical excess returns over a 10-year period is, the AER concluded, somewhere between the geometric and arithmetic mean.[21]

But the arithmetic mean and the geometric mean are not bounds to be considered, for estimating the mean of historical excess returns.

The AER advises that use of the geometric mean is to be considered because:

- there remains uncertainty over whether an arithmetic or geometric average or some combination of the two provides a better estimate of expected excess returns due to the variability of returns from year to year;
- there are studies and academic examples showing there are periods in which the geometric average is the best estimator; others show the arithmetic mean to be superior; and
- over periods of changing volatility, the arithmetic mean can be upwardly biased whereas the geometric mean is not impacted as much by volatility changes over time in long series.[22]

There is no uncertainty over whether an arithmetic or geometric average or some combination of the two provides a better estimate of expected excess returns. The mean of historical excess returns required as an estimate of the MRP is the arithmetic mean; it is not the geometric mean. However, the geometric mean can be used to

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21 Australian Energy Regulator, *Overall rate of return, equity and debt omnibus: Final working paper*, December 2021, page 43.

22 Australian Energy Regulator, *Overall rate of return, equity and debt omnibus: Final working paper*, December 2021, page 43.

estimate the required arithmetic mean by adjusting the former by a factor which measures the volatility in log-normal returns.

Although there are studies and academic examples showing periods in which the geometric average may appear to be a suitable estimator these studies are not concerned with estimation of the MRP from historical excess returns. As Wright, Mason and Miles noted, the geometric mean is the natural metric of returns from the perspective of an investor: an investment with a positive geometric mean return will grow over time. If, as might be the case in portfolio planning, returns are compounded over an extended period then, as Marshall Blume has argued, the geometric mean is the better estimator of the compound growth rate to be applied over the period.[23] This can be seen from the following simple example.[24]

Suppose an investment has a return of 20% after one year, and has a return of -20% at the end of a second year. The arithmetic mean of the returns is:

$$\frac{20\% + (-20\%)}{2} = 0\%$$

The geometric mean is:

$$[(1 + 0.20)(1 - 0.20)]^{1/2} - 1 = -2.02\%$$

The geometric mean is also the overall rate of return on the investment:

| **Year** | | **0** | **1** | **2** |
|---|---|---|---|---|
| Net cash flow | | -1.00 | 0.00 | 0.96 |
| | | | =1.00*(1 + 0.20) -1.2 | = 1.20*(1 - 0.20) |
| Return | **-2.02%** | | | |

When returns are compounded over an extended period, the geometric mean is the better estimator of the overall rate of return on an investment than the arithmetic mean. Using an arithmetic mean of periodic (year-by-year) rates of return to estimate the rate of return over the extended period imparts an upward bias to the end-of-period portfolio balance. The bias imparted if the arithmetic mean is used has been further examined by others.[25]

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23 Marshall E Blume (1074), "Unbiased Estimators of Long-run Expected Rates of Return", Journal of the American Statistical Association, 69(347), pages 634-638.

24 The example is from Jonathan Berk and Peter DeMarzo (2014), *Corporate Finance*, third ed., Pearson: Boston, page 326.

25 See, for example, Daniel C Indro, Wayne Y Lee (1997), "Biases in Arithmetic and Geometric Averages as Estimates of long Run Expected Returns and Risk Premia", Financial Management, 26(4), pages 81-90; Eric Jacquier, Alex Kane, Alan J Marcus, "Optimal Estimation of the Risk Premium for the Long Run and Asset Allocation", Journal of Financial Econometrics, 3(1), pages 37-55.

This issue of upward bias when estimating expected future portfolio value using the arithmetic mean of period-by-period returns over an extended period is not the same as the issue of estimating the mean of a returns distribution using historical time series data. The upward bias imparted to a future portfolio value calculated using an arithmetic mean of period-by-period rates of return is not the issue which arises when using historical excess returns to estimate the MRP. When estimating the MRP, there is no compounding of returns year-by-year over the period for which historical data are available.

As Dr Martin Lally noted in a 2012 report for the AER, there may be compounding of the regulatory rate of return over the regulatory period, but this is not the issue of using historical excess returns to estimate the MRP.[26] Dr Lally advised:

*The AER's belief that geometric averages are useful apparently arises from a belief that there is a compounding effect in their regulatory process (AER, 2012, Appendix A.2.1), and therefore the analysis of Blume (1974) and Jacquier et al (2003) applies. However, I do not think that there is any such compounding effect in regulatory situations and the absence of a compounding effect leads to a preference for the arithmetic mean over the geometric mean.*[27]

We note that in their seminal paper on the MRP published in 1985, Mehra and Prescott used the arithmetic mean of historical excess returns.[28] They continued to use the arithmetic mean in their paper "The Equity Premium in Retrospect", published in the *Handbook of The Economics of Finance* in 2003, advising that the arithmetic mean is the correct statistic if one is interested in the mean value of excess returns.[29]

Similar advice is given in the well-known textbook by Jonathan Berk and Peter DeMarzo. Berk and DeMarzo note that the MRP can be estimated as the average of the historical excess of returns on the market over the risk free rate and advise: because we are interested in the expected return, the correct average to use is the arithmetic mean.[30]

In APA's view, there is no support for the AER's contention that there is uncertainty over whether an arithmetic or geometric average or some combination of the two provides the better estimate of expected excess returns. The arithmetic mean provides the correct estimate of expected excess returns. There may be studies and

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26 Martin Lally, *The Cost of Equity and the Market Risk Premium*, 25 July 2012.

27 Martin Lally, *The Cost of Equity and the Market Risk Premium*, 25 July 2012, page 31.

28 Rajnish Mehra, Edward C Prescott (1985), "The Equity Premium: A Puzzle", Journal of Monetary Economics, 15, pages 145-161.

29 Rajnish Mehra, Edward C Prescott (2003), "The Equity in Retrospect", in George M Constantinides, Milton Harris, Rene M Stulz, *Handbook of The Economics of Finance, vol. 1B, Financial Markets and Asset Pricing*, Amsterdam: Elsevier, pages 889-938.

30 Jonathan Berk, Peter DeMarzo (2014), Corporate Finance, 3rd edition, Boston: Pearson, page 406.

academic examples showing periods in which the geometric average is the better estimator, and others which show the arithmetic mean to be superior, but these studies are concerned with measuring portfolio value from returns which are compounded over extended periods. These studies are not relevant to the issue of using historical excess returns to estimate the MRP.

The third of the reasons why the AER proposes consideration of the geometric mean is that, in periods of changing volatility, the arithmetic mean can be upwardly biased whereas the geometric mean is not impacted as much by volatility changes over time in long series. This seems to be, once again, the issue of estimating future portfolio value over a period. It does not, in itself, provide any support for use of the geometric mean when estimating the mean of historical excess returns.

To use the geometric mean to estimate the mean of a distribution of excess returns from a time series of historical excess returns, which may or may not show periods of changing volatility, is without foundation in economic and statistical theory. If, as the AER suggests, returns are time varying, then that time variation should be explicitly modelled and the model (or models) should be properly estimated. This, Gibbard advised the ACCC and the AER in 2013, may be challenging. Nevertheless, estimation would be estimation of the mean of an underlying distribution (the parameters of which were changing in a specified way over time): it would be estimation using an arithmetic mean, and not a geometric mean.

***Looking at the data***

Continuing to assume the MRP is a constant to be estimated as the arithmetic mean of historical excess returns does not remove the problem of the high variability in those excess returns (see Figure 1 below). Given this variability, the longest available series of excess returns should be used when estimating the arithmetic mean.

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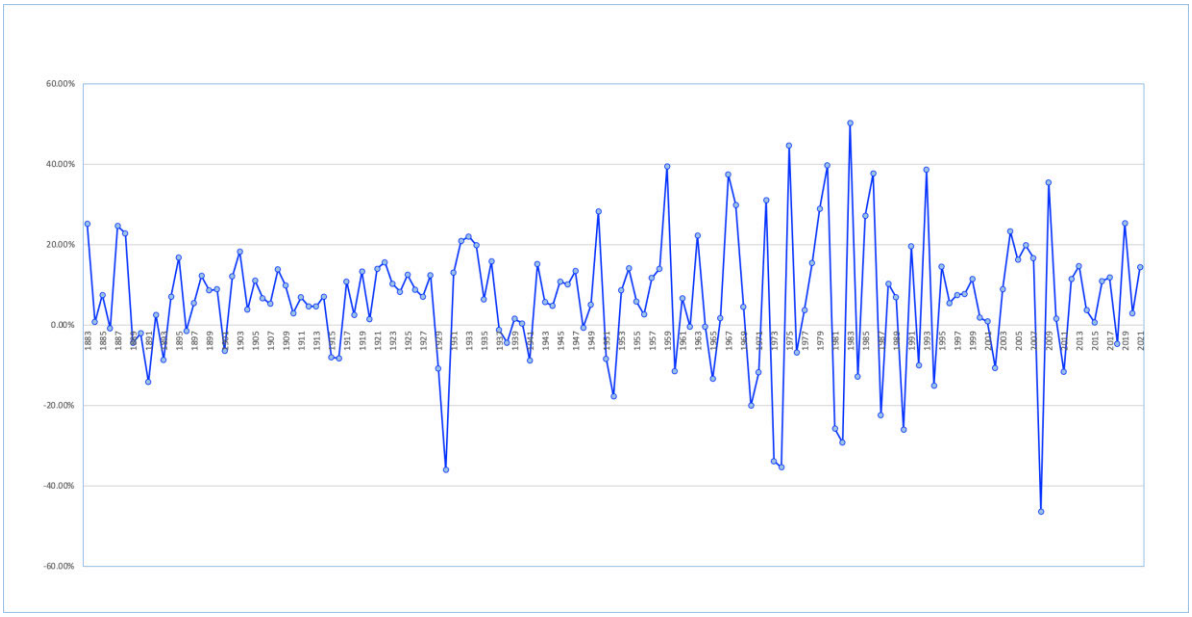
***Figure 1: excess returns: Australia 1883- 2021***




*Source: Brailsford, Handley and Maheswaran (2012) for the period 1883-2010; AER for 2011 to 2017; and GGT calculations for 2018-2021.*

When we look at the Brailsford, Handley and Maheswaran dataset extended forward to 2017, we find:

- arithmetic mean of excess returns = 6.29%
- geometric mean of excess returns = 4.95%
- mean of log-returns = 4.84%
- sample variance of log-returns = 2.69%
- arithmetic mean estimated from geometric mean (using the sample variance as an estimator of the variance of the log-returns distribution):

$$4.95\% + \frac{2.69\%}{2} = 6.30\%$$

The arithmetic mean estimated from the geometric mean (6.30%) is very close to the arithmetic mean estimated directly from the data (6.29%).

If the Brailsford, Handley and Maheswaran data set is extended forward to 2021:

- arithmetic mean of excess returns = 6.38%
- geometric mean of excess returns = 5.07%
- mean of log returns = 4.94%
- sample variance of log-returns = 2.65%
- arithmetic mean estimated from geometric mean (using the sample variance as an estimator of the variance of the log-returns distribution):

$$5.07\% + \frac{2.65\%}{2} = 6.39\%$$

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Again, the arithmetic mean estimated from the geometric mean (6.39%) is very close to the arithmetic mean estimated directly from the data (6.38%).

The estimate of MRP in the AER's 2018 Rate of Return Instrument, 6.1%, appears, to APA, to be biased downwards by around 30 basis points.

We note that the estimate from the arithmetic mean of historical excess returns for the data set 1883 to 2020 reported in the AER's December 2021 Rate of *Rate of return: Annual update* is 6.4%.

Other things being equal, we would expect to see, in the 2022 Rate of Return Instrument, an estimate of the MRP of at least 6.4%.

But are "other things equal"?

In the current dataset (1883-2021), of 139 excess return observations, 37 are negative: the return on the market is less than the risk free rate. If the dataset is reduced to the period from 1958, the period for which Brailsford, Handley and Maheswaran consider the data to be reasonably reliable, some 20 of the excess return observations are still negative.[31]

This may not be of concern if historical excess returns are not interpreted as measuring a simple premium for risk. It may not be of concern if historical excess returns are seen as being the combined result of taxes, borrowing constraints, and investor recognition of rare and disastrous (portfolio destroying) events.[32]

Negative historical excess returns are, we think, a concern if those returns are being used to measure the market risk premium of the CAPM. They are inconsistent with the asset market equilibrium described by the model. A necessary condition for CAPM equilibrium is that the expected return on the market is greater than the risk free rate.[33]

Do these negative excess returns impart a downward bias to the estimate of the MRP required for application of the CAPM when that estimate is made using historical data? Is this possibility of downward bias in the estimate of the MRP made from historical excess returns one of the reasons why estimates made using the dividend growth model appear to be "too high"?

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31 Tim Brailsford, John C Handley, Krishnan Maheswaran (2008), "Re-examination of the historical equity risk premium in Australia", Accounting and Finance, 48(1), page 75.

32 See, for example, Ellen R McGrattan and Edward C Prescott (2005), "Taxes, Regulations and the Value of U.S. and U.K. Corporations", Review of Economic Studies, 72(3), pages 767-796; George M Constantinides, John Donaldson, Rajnish Mehra (2002), "Junior Can't Borrow: A New Perspective on the Equity Premium Puzzle", Quarterly Journal of Economics, 117(1), pages 269-296; and Robert J Barro (2006), "Rare Disasters and Asset Markets in the Twentieth Century", Quarterly Journal of Economics, 121(3), pages 823-866.

33 See, for example, Robert C Merton (1982), "On the Microeconomic Theory of Investment Under Uncertainty", in K J Arrow and M Intriligator (eds.), *Handbook of Mathematical Economics*, vol. II, Amsterdam: North-Holland, Proposition 4.6, page 628.

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These are, we think, important questions which should be answered before proceeding.

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## Equity beta estimation

### 11. *Do you agree with AER's preliminary position of maintaining its current approach to estimating the equity beta?*

APA does not agree with the AER's preliminary position of maintaining its current approach to estimating the equity beta.

In APA's view, placing most weight on the longest period estimates is inappropriate when the circumstances of electricity network and gas pipeline service providers are undergoing long-term changes.

These changes are, we think, the reason why there appears to be a difference between the betas for Australian electricity network and gas pipeline service providers. Further examination of that difference will require recourse to data from international comparators.

There is currently little to be learned, for beta estimation, from data for other (non-energy) Australian infrastructure businesses, or from the decisions of other regulators.

APA understands the AER's preliminary position on beta estimation to be the position summarised on page 102 of the *Overall rate of return, equity and debt omnibus: Final working paper*. The preliminary position includes:

- **placing most weight on the longest period estimates;**
- **retaining the existing comparator set, and not using international energy firms, domestic infrastructure firms or other regulators' decisions to inform a range for beta;**
- **continuing to set a single rate of return for gas and electricity network businesses; and**
- **not adjusting the beta estimate itself, or the rate of return, for a low beta bias.**

APA's principal concerns with the AER's preliminary position are:

- **placing most weight on the longest period estimates when both the electricity networks sector and the gas pipelines sector are undergoing structural change as part of a broader "transition to renewables"; and**
- **continued use of a single beta, and hence a single rate of return, for electricity network and gas pipeline service providers when sectoral changes appear to be driving different betas for electricity and gas.**

Our concerns with placing most weight on the longest period estimates are set out in our response to the AER's Question 12.

APA's concerns with using data for other Australian infrastructure firms in beta estimation for electricity network and gas pipeline service providers are noted in our response to Question 13.

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We see task of reviewing and replacing the current Rate of Return Instrument as being quite unique to Australian circumstances and the AER's implementation of the regulatory regimes of the National Electricity Law and the National Gas Law. In these circumstances, other regulators' decisions might be examined by the AER in its deliberations on beta, but those decisions cannot inform a range for beta estimation. They are not decisions made in the same context as AER decisions on beta.

APA is of the view that current circumstances, and the available evidence, draw into question the continued use of a single beta, and hence a single rate of return, for electricity network and gas pipeline service providers. The evidence suggests, to us, that the betas for electricity network and gas pipeline service providers are different and have been different for at least five years. There is, however, insufficient Australian data which might assist further examination of this issue. We are aware of, and have previously drawn attention to, the problems of using international comparators in beta estimation, but now see little alternative to including relevant international firms in the comparator set. The additional data are required not only to address questions of difference between electricity and gas, but also for greater precision in beta estimates.

APA has previously expressed concern about low beta bias, which has only been partially addressed. However, at present, low beta bias is, in our view, a "second order issue", and we do not advocate any adjustment for this bias when determining the beta estimate to be used in the 2022 Rate of Return Instrument.

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***12. What are the pros and cons of using beta estimates made using the longest available data series? How much weight should be placed on estimates made using the most recent five years of data given market volatilities in recent years?***

Betas are changing, not as a consequence of mispricing errors, but because long-term changes are taking place in the markets for electricity network and gas pipeline services in the context of a broader "transition to renewables".

The time series of returns from which beta is to be estimated is not stationary, and we cannot expect reversion to an underlying long-term beta which is constant.

The best we can do at present is to make estimates of beta using the most recent five years of data.

The data indicate that, when the shock of the Covid-19 pandemic is removed, any change in volatility is small compared to the trends which have appeared in beta estimates.

The case for using beta estimates made using the longest available data series was made by Dr Boyle in his presentation during the first of the AER's expert evidence sessions.

Dr Boyle advised that, if the joint distribution of returns were independently and identically distributed, with the implication that beta was constant, then the estimate of beta should be made with the longest time series available. If the joint distribution of returns were not independently and identically distributed, but the time series of returns was stationary, then there were two betas:

- **an unconditional (long-term) beta, which was a constant; and**
- **a conditional (short-term) beta, which was mean reverting.**

The unconditional beta should be estimated with the longest time series available.

If the mean reversion of the conditional beta were the result of mispricing of the stock for which beta was being estimated, then the estimate should, again, be made with the longest series available. If, however, deviation of the conditional beta from the unconditional beta were thought to be a consequence of variation in risk pricing, then use of a shorter time series for beta estimation may be desirable. The difficulty, in this second case, was identifying and explaining the variation in pricing risk.

There was, of course, another possibility: the joint distribution of returns was not independently and identically distributed, and the time series of returns was not stationary. In these circumstances there was no predictability from past data and, as Dr Boyle succinctly summarised: "... we are stuffed." However, he explained that such a possibility was very unlikely.

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Dr Boyle concluded that the optimal approach to beta estimation would depend on the existence, source and speed of mean reversion in beta. In the absence of robust evidence on the existence, source and speed of mean reversion, the "safety-first" approach was use of the longest time series available.

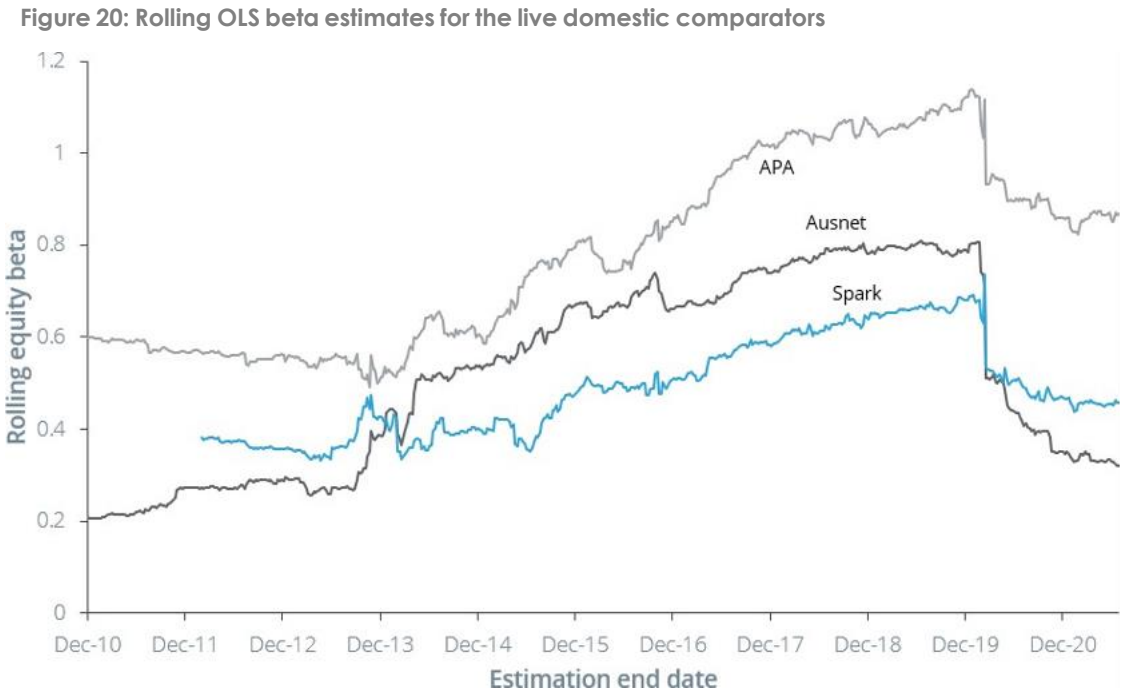
APA agrees with much of Dr Boyle's advice but doubts its relevance. We think that betas are changing, not as a consequence of mispricing errors, but because long-term changes are taking place in the markets for electricity network and gas pipeline services in the context of a broader "transition to renewables". The time series of returns from which beta is to be estimated is not stationary, and we cannot expect reversion to an underlying long-term beta which is constant. The best we can do at present is to estimate beta using the most recent five years of data. Unfortunately, there are further complications.

We turn to Slide 2 of Mr Kumareswaran's presentation during the first of expert evidence sessions.

Mr Kumareswaran's Slide 2 presents a graph - reproduced as Figure 1 below - which is identified as being from page 80 of Energy Networks Australia's response to the AER's draft equity omnibus working paper dated 3 September 2021.

We acknowledge that neither Mr Kumareswaran, nor Energy Networks Australia, has made the inference from the information presented in the graph of Slide 2 which we make in the following paragraphs.

***Figure 1: Mr Kumareswaran's Slide 2***




*Source: Bloomberg data; Frontier Economics calculations. Rolling 5-year OLS beta estimates using weekly data. Re- levered to 60%.*

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The graph from Slide 2 shows rolling OLS beta estimates for APA Group, AusNet Services and Spark Infrastructure over a period commencing at December 2010 and ending after December 2020 (but before December 2021).

APA Group, AusNet Services and Spark Infrastructure were, at the time the graph was prepared, all of the "live" (listed on the Australian Stock Exchange) Australian regulated electricity network and gas pipeline system service providers.

Table 13 of the AER's *Overall rate of return, equity and debt omnibus: Final working paper* identifies APA Group as operating in the gas sector, but with minority interests in other energy infrastructure. AusNet Services and Spark Infrastructure are identified, in the table, as operating in electricity and gas.

However, AusNet services is primarily an electricity transmission and distribution network service provider. Certainly, it is also the owner and operator of gas distribution assets. In the year ended 31 March 2021, the company reported that 79% of its revenue was earned from electricity transmission and distribution. A further 10% of revenue was from its Growth and Future Networks business segment, which appears to have a strong focus on business opportunities in the electricity sector. AusNet Services operates in the electricity sector but has some interest in gas distribution.

Similarly, Spark Infrastructure is primarily an electricity transmission and distribution network service provider. Spark Infrastructure's 2020 financial statements show all of the company's revenues earned by business segments in the electricity sector: Victorian Power Networks, SA Power Networks, Transgrid and Bomen Solar Farm. Some 86% of revenue reported for the year was earned by Victorian Power Networks, SA Power Networks and Transgrid which are predominantly electricity distribution and transmission businesses.

APA Group is primarily a gas pipeline service provider. AusNet Services and Spark Infrastructure are primarily electricity transmission and distribution businesses.

The graph in Slide 2 of Mr Kumareswaran's presentation shows the APA Group beta above the betas for AusNet Services and Spark Infrastructure from December 2010 to around December 2013. Around December 2013, there appears to be some convergence of the betas to a similar level. But after December 2013, they diverge again.

The betas for all three companies rise between December 2013 and December 2019. Then, after December, they drop sharply. In his presentation, Mr Kumareswaran attributed the drop to the onset of the Covid-19 pandemic. After the sharp drop, the betas continue to fall, but less dramatically. Our own calculations, using data to December 2021, suggest they may be levelling. Nevertheless, the clear difference between the beta for APA, and the betas for

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AusNet Services and Spark Infrastructure, which appeared in the data after December 2013 continues after December 2019.

The trends in data after December 2013 do not support continued reliance on the longest available data series. When estimating beta for the 2022 Rate of return Instrument, most weight should be placed on estimates made using the most recent five years of data. Inspection of the graph in Slide 2 suggests that the beta estimates have become more volatile since 2013, but the change in volatility is small compared to the trends which have appeared in the data.

APA would agree that three comparators might be a "small sample" for beta estimation. The inclusion of data for DUET Group could be considered, but DUET was delisted in May 2017. There is no larger population of listed Australian regulated electricity network and gas pipeline service providers from which a sample could be drawn.

In October 2020, when responding to the AER's draft working paper *CAPM and alternative return on equity models*, APA had reservations about using the data from "international comparators" for beta estimation. Given the diminishing sample of listed Australian regulated electricity network and gas pipeline service providers, and a clear difference between the electricity network service providers and the gas pipeline service provider in that sample, we think consideration must now be given to augmenting the set of Australian comparators using data from energy businesses in other countries.

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***13. Are there any transparent, robust and practical approaches for adjustment of the data for energy businesses in other countries, or for the adjustment of data for Australian infrastructure businesses not in the energy sector, which might allow those data to be used in beta estimation?***

There are practical approaches for adjustment of the data for energy businesses in other countries which might allow those data to be used in beta estimation for Australian regulated electricity network and gas pipeline service providers.

APA has not used these approaches and does not know how transparent or robust they might be.

APA is not aware of any transparent, robust and practical approach which might be used to adjust the data for Australian infrastructure businesses not in the energy sector to allow those data to be used in beta estimation for regulated electricity network and gas pipeline service providers.

Even if ways can be found to assess the similarity of other Australian infrastructure businesses with the regulated electricity network and gas pipeline service providers, and to adjust the data for those businesses to allow their use in beta estimation, the number of potential comparators which might be available is relatively small and likely to reduce further.

In a report for the Australian Competition and Consumer Commission (ACCC) prepared in 2002, The Allen Consulting Group noted the small number of listed Australian gas transmission pipeline businesses at the time, and recommended the use, in beta estimation for those businesses, of beta estimates for foreign firms.[34] The primary source of information for beta estimation, The Allen Consulting Group advised, should be the Australian service providers, but the ACCC should also examine the equity betas of foreign firms. The report then addressed a series of issues expected to arise when using data for those foreign firms.

Briefly:

- **the foreign firms should be restricted to those operating in countries with legal systems comparable to the Australian legal system which, in practice meant limiting foreign firms to those in Canada and the United States, and in the United Kingdom;**
- **many privately owned gas transmission pipelines in North America were owned by firms which had substantial interests in other activities; as far as possible, the set of comparators should be restricted firms which were close to being transmission-only companies;**
- **the beta estimates of all firms should be measured against the market returns in their home equity markets; what was important was the strength of the relationship between the**

[34] The Allen Consulting Group, *Empirical Estimates on Proxy Beta values for Regulated Gas Transmission Activities*, July 2002.

returns to an individual firm and the returns on the market portfolio for the equity market in which the firm operated;

- delevering and relevering should take account of differences in average gearing levels across countries;
- neither the Vasicek adjustment nor the Blume adjustment should be made to the betas of the (Australian and foreign) firms in the comparator set; and
- a simple average of the estimates of the betas for the firms in the comparator set should be used as the estimate of beta for an Australian gas transmission business (recognising that, from time to time, the beta estimates for some of the comparables could be negative, and this was best dealt with by making an estimate with the negative beta values included, and an estimate without those values).

The Allen Consulting Group report noted (in Chapter 5) that The Brattle Group had produced beta estimates for the initial access arrangement for the Dampier to Bunbury Natural Gas Pipeline in Western Australia. This had been done by estimating betas for a sample of US transmission pipeline businesses measured against a US market index the components of which were reweighted to resemble the Australian stock market. A number of specific concerns were raised about the methods and data which The Brattle Group had used, but The Allen Consulting Group acknowledged that this reweighting of the market index had a number of desirable attributes.

There are, then, practical approaches for adjustment of the data for energy businesses in other countries which could allow those data to be used in beta estimation for Australian regulated electricity network and gas pipeline service providers. APA has not used these approaches and does not know how transparent or robust they might be.

The potential problems with the use of data for energy businesses in other countries are well-known. We do, however, have the opportunity to observe, in those other countries, businesses which are electricity transmission and distribution businesses, and gas transmission and distribution businesses, which are subject to schemes of regulation broadly similar to those applying in Australia.

There is no prior reason, in our view, to expect that Australian infrastructure businesses based on different technologies, with different operating environments and different markets, and subject to different forms of regulation, will have systematic risks similar to those of regulated electricity network and gas pipeline service providers. That similarity would have to be carefully assessed.

APA is not aware of any transparent, robust and practical approach to assess the similarity of other Australian infrastructure businesses with the regulated electricity network and gas pipeline service providers. Nor are we aware of any approach to adjustment of the data for those businesses which might allow those data to be

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used in beta estimation for regulated electricity network and gas pipeline service providers.

There are, we think, currently around seven listed Australian infrastructure businesses which might be considered. They are: Auckland International Airport, Atlas Arteria, Aurizon, Meridian Energy, Qube, Sydney Airport and Transurban. On assessment, some of these businesses may be excluded from the comparator set because they are found to be dissimilar to regulated electricity network and gas pipeline service providers. Others, we expect, will be delisted following acquisition and merger activities which, we understand, are currently in various stages of progression. Even if ways can be found to assess the similarity of other Australian infrastructure businesses with the regulated electricity network and gas pipeline service providers, and to adjust the data for those businesses to allow their use in beta estimation, the number of potential comparators which might be available is relatively small and likely to reduce further.

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***14. Is there any empirical evidence on materially different systematic risks for regulated electricity networks and gas pipeline systems? Is there any evidence on the magnitude of regulated pipeline stranding risk, and for any part of that risk being systematic?***

There is empirical evidence on materially different systematic risks for regulated electricity networks and gas pipeline businesses.

This evidence is not definitive, but clearly calls for further examination of the issue.

APA is not aware of any evidence on the magnitude of regulated pipeline stranding risk.

There are reasons for expecting that a part of pipeline stranding risk is systematic and, therefore, reflected in the rising beta estimate for APA Group. Stranding risk may also be a factor contributing to the rising beta estimates for electricity network service providers AusNet Services and Spark Infrastructure.

APA noted, in its response to Question 12:

- **APA Group is primarily a gas pipeline service provider; the other two "live" Australian regulated businesses, AusNet Services and Spark Infrastructure, are primarily electricity transmission and distribution service providers;**
- **the graph in Slide 2 of Mr Kumareswaran's equity beta presentation at the first expert evidence session therefore provides empirical evidence on materially different systematic risks for regulated electricity network and gas pipeline service providers (although neither Mr Kumareswaran, nor Energy Networks Australia, the source of the graph, has made this claim);**
- **after converging to a similar level by around December 2013, the estimated (OLS) betas for APA Group, and for AusNet Services and Spark Infrastructure, diverge again: the beta for APA Group rises from around 0.5 to about 1.1 by December 2019; the beta for Ausnet Services rise from about 0.5 to 0.8, and the beta for Spark Infrastructure rises from around 0.4 to about 0.7;**
- **the APA Group beta increases more rapidly than the betas for AusNet Services and Spark Infrastructure;**
- **the betas for the three firms drop sharply at around December 2019, possibly due to the onset of the Covid-19 pandemic, and then decline slowly, leveling out, we think, by December 2021;**
- **although the betas drop sharply at around December 2019, the difference between them quickly re-emerges: the APA Group beta is around 0.8; the betas for AusNet Services and Spark Infrastructure are around 0.35 and 0.5 respectively.**

There is, in the graph in Slide 2 of Mr Kumareswaran's presentation (Figure 1 above), empirical evidence of materially different systematic risks for regulated electricity network and gas pipeline businesses.

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Three factors might contribute to this material difference in systematic risks. They are:

- the regulatory regime applying to electricity network service providers is different from the regime applying to gas pipeline service providers;
- gas transmission pipelines are affected by the transition to a low-carbon economy in ways which make them more risky than electricity transmission and distribution networks; and
- gas transmission pipelines are now subject to stranding risk, at least a part of which is systematic (although we do not discount the possibility that some electricity transmission networks may also be subject to stranding risk).

We assess each of these three factors in the paragraphs which follow.

*Different regulatory regimes applying to electricity networks and gas pipelines*

Electricity networks are subject to revenue cap regulation. Over a regulatory period, a network service provider receives the revenue, as determined by the regulator, at the beginning of the period. During the period, prices are adjusted annually to ensure recovery of the allowed revenue (the revenue cap). Realised returns are, in these circumstances, determined only by the service provider's ability to manage its costs against the forecasts used in setting the revenue cap.

Gas pipeline systems are subject to either weighted average price cap regulation, or to information disclosure and arbitration regulation. The information and disclosure regime of the National Gas Rules does not explicitly and tightly constrain prices for pipeline services. Under a weighted average price cap, prices can be changed annually, but only within a cap set by the regulator. Realised returns are, then, determined by a service provider's ability to:

- expand its service provision relative to the forecast of service provision used by the regulator to set the weighted average price cap; and
- manage its costs against the forecasts used in setting the price cap.

In these circumstances, gas pipeline businesses might be expected to show greater covariation of returns with the return on the market than electricity network businesses. The forms of regulation applying to gas pipelines could result in a beta for pipeline businesses which is higher than the beta for electricity network service providers. Furthermore, the betas for pipelines subject to information disclosure and arbitration may be higher than the betas for those pipelines which are subject to weighted average price caps. It is this latter category - the pipelines subject to weighted average price caps - in respect of which the 2022 Rate of Return Instrument is to apply.

APA Group owns and operates only four fully regulated pipeline systems (in respect of which the 2022 Rate of Return Instrument is to apply). Other pipelines owned and operated by the Group are regulated under the "lighter" information disclosure and arbitration regime.

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The beta for APA Group may, therefore, be higher than the beta applicable to a fully regulated pipeline system and may be higher than the beta for a regulated electricity network, because of the relatively high proportion of "lightly regulated" pipelines in the Group's asset portfolio.

Could this explain the difference in the betas shown in the graph in Slide 2 of Mr Kumareswaran's presentation? We think that it cannot. Irrespective of the form of regulation, gas transmission pipelines provide services to users primarily under long term contracts for capacity which limit revenue volatility, particularly in times of economic change (rising or falling financial markets). The difference in betas for pipelines fully regulated under weighted average price caps and pipelines regulated under information disclosure and arbitration is, therefore, not likely to be great.

Our view is supported by the findings of research into the implications of regulation for systematic risk. Some earlier research had seemed to show that some forms of regulation (forms of incentive regulation including price cap regulation) implied higher levels of systematic risk than other forms of regulation (including rate of return regulation) which facilitated service provider cost recovery. However, from an econometric study using a sample of 93 firms in six countries - Australia, Canada, Ireland, New Zealand, the United Kingdom and the United States - Gaggero found that different forms of regulation did not play a significant role in the determination of the systematic risks of regulated businesses.[35] From a further study using a panel of 170 regulated firms operating in electricity, gas, water, telecommunications and transport, Gaggero concluded that his earlier findings were confirmed by a larger and more heterogeneous sample.[36]

*Transition to a low-carbon economy*

The implications of transition to a low-carbon economy for gas transmission pipelines, and for pipeline systematic risk, were discussed in APA's (confidential) submission, made in September 2021, on the AER's three draft working papers – *Equity Omnibus*, *Draft Debt Omnibus Paper*, and *Overall rate of return*.

In that submission, we observed that as the effects of climate change and its possible future evolution were becoming better understood, as new opportunities were emerging from technological change, and as governments were responding, investor perceptions of the risks of investing in the energy sector were changing. Investors were now seeking compensation for their exposures to carbon transition risks. A carbon premium had materialised, but only recently. The change in

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35 Alberto A Gaggero (2007), "Regulatory risk in the utilities industry: An empirical study of the English-speaking countries", Utilities Policy, 15, pages 191-205.

36 Alberto A Gaggero (2012), "Regulation and Risk: A cross-country survey of regulated companies", Bulletin of Economic Research, 64(2), pages 226-238.

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perceptions had become clear since the COP21 Paris Agreement of 2015 and was being attributed, in part, to increased salience of climate risks following that agreement.

Internationally, equity investors, banks and bond holders were pricing carbon transition risk into equity and debt for the gas sector. They did not seem to have the same concern for transition risk when assessing investments in electricity transmission and distribution networks. At present, with government policies supporting electrification as paths to low-carbon economies, electricity networks seem to have more assured future. The pricing implications of carbon transition risk are now well recognised internationally (they are also recognised to the point where they are finding their way into studies of how equity is priced). From our discussions with equity investors, we have discerned that transition risk has begun to influence pricing in Australian financial markets.

The higher equity beta for APA Group shown in the graph in Slide 2 of Mr Kumareswaran's presentation is, we think, at least partially attributable to the way in which investors are pricing the risks of transition to a low-carbon economy into the price of equity for transmission pipelines.

*Asset stranding risk*

In the context of transition to a low-carbon economy, stranding risk has become an important issue for gas transmission pipelines. This has been reflected in the AER's publication, in November 2021, of an information paper, *Regulating gas pipelines under uncertainty*, in which the issue of stranding risk, its implications for energy users, and possible ways in which it might be addressed were examined.

APA is not currently aware of any evidence on the magnitude of regulated pipeline stranding risk. Nor can we ascertain, with precision, any impact that the prospect of asset stranding may have on the returns sought by pipeline investors.

Nevertheless, we think there are good reasons for expecting that stranding risk may be contributing to the higher systematic risks for transmission pipelines, and to the higher beta for APA Group.

We do not discount the possibility of stranding risk also being a factor contributing to the rising beta estimates for electricity network service providers AusNet Services and Spark Infrastructure. Distributed generation is placing at risk some electricity network assets. However, centralised generation, and the transfer of energy through existing network assets, are still expected to be required for the back-up of mainly renewables-based distributed generation. Furthermore, large-scale renewables generation in designated renewable energy zones, is expected to create new opportunities for electricity transmission network service providers.

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Stranding risk affects returns in two ways.[37] The first of these is through an increase in the non-diversifiable variability of expected future cash flows. The likelihood of stranding, and the magnitude of the effect, are increased in times of depressed economic activity, when demand for pipeline services is reduced. Moreover, they are reduced when the economy is buoyant, and the demand for pipeline services is increasing. The risk of stranding, then, increases the variability of cash flows to equity investors across the business cycle, and therefore increases beta.

The second way in which stranding risk affects returns is via a reduction in the value of future expected cash flows. Without a prior commitment from the regulator to compensate for the risk, investors in assets which face the prospect of stranding will expect to earn a return on regulated assets which is less than an allowed rate of return which has been set to equal the current cost of capital. If investors are to expect a rate of return on regulated assets equal to the cost of capital, they will require a credible guarantee that stranded costs will be passed through to remaining customers once stranding occurs, or they will require a premium (over and above the current cost of capital) in the allowed rate of return to compensate for the expected value of the loss they will incur in the event of asset stranding.

The second of these ways in which stranding risk affects returns on regulated pipeline assets may operate at present but could be reduced in future if the AER were to accelerate depreciation on those assets.

In our view, the graph in Mr Kumareswaran's Slide 2 provides evidence for materially different systematic risks for regulated electricity networks and gas pipeline businesses. The graph clearly shows increasing betas for pipeline service provider APA Group, and for electricity network service providers AusNet Services and Spark Infrastructure after December 2013, and the emergence of a substantial difference between the systematic risks of the gas pipeline service provider and those of the electricity network service providers which continues after the sharp drop in returns attributable to the Covide-19 pandemic. These differences could be driven by different implications of the transition to a low-carbon economy for electricity networks and gas pipelines systems and, in particular, by different risks of asset stranding. We do not think they are driven by differences in regulation.

None of this is definitive, and further examination of the issue of a material difference in systematic risks is required.

That examination cannot be made using Australian data: there are none beyond the returns for APA Group, AusNet Services and Spark Infrastructure. It must be carried out using data from international comparators, as we noted in our response

[37] A Lawrence Kolbe and Lynda S Borucki (1998), "The Impact of Stranded-cost risk on Required Rates of Return for Electric Utilities: Theory and an Example", Journal of Regulatory Economics, 13, pages 255-275.

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to Question 13, and should be carried out recognising the problems which can arise from the use of data generated in other countries.

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## Use of the Energy Industry Credit Spread Index

***15. Do you agree with our preliminary position to further consider whether to make adjustments for the residual outperformance of the EICSI compared to our benchmarks?***

The risk component of the EISCI averages a small number of firm-specific risks. APA considers any measure of residual outperformance of the index to be an inadequate basis for benchmark adjustment.

We refer back to our response to Question 3. The risk component of the EISCI averages a small number of firm-specific risks. Any measure of residual outperformance of the index is an inadequate basis for benchmark adjustment.

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### 16. *Do the results of the AER's analysis justify an adjustment to remove any residual outperformance that is material and persistent?*

The results of the AER's analysis do not, in APA's view, justify adjustment to remove residual outperformance. The EISCI cannot provide an adequate measure of outperformance.

See APA's response to Question 3.

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***17. Could a cap or other constraint be applied to the credit spread implied by the cost of debt benchmarks to remove the observed outperformance against the EICSI?***

The EISCI does not provide a measure of outperformance of the cost of debt benchmarks. No cap or other constraint on those benchmarks is, then, required.

See APA's response to Question 3.

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***18. Should the AER adjust the for the difference between the credit spread of the EISCI and the spread implied by its cost of debt benchmarks, or should the AER adjust the benchmark term directly? If the benchmark term were to be adjusted, how would this be done?***

The difference between the credit spread of the EISCI and the spread implied by the cost of debt benchmarks does not provide a basis for adjustment of the benchmark term.

See APA's response to Question 3.

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## CAPEX weighting of the trailing average rate of return on debt

### *19. What are the relative merits of the AER's four options?*

Option 2 seems to lead to a better estimate of the return on debt allowance than Option 1. APA does not see strong rationales for Options 3 and 4.

A specific proposal, which might be implemented through the Rate of Return Instrument, should be developed for review.

The four options for cost of debt estimation set out in the Information Paper are:

1. maintain the current (simple, equally weighted, trailing average) approach;
2. for each distribution and transmission service provider, estimate the cost of debt using weights based on the debt issuance assumptions of the Post-tax Revenue Model;
3. use a trailing average with unequal weights, based on the debt issuance assumptions of the Post-tax Revenue Model, whenever a threshold (large) increase in the regulatory asset base is exceeded (below the threshold, the current equally weighted trailing average approach would apply);
4. for transmission network service providers, estimate the cost of debt using weights based on the debt issuance assumptions of the Post-tax Revenue Model (for

The discussion of the options in the final working paper, *Overall rate of return, equity and debt omnibus*, and the analysis of section 3 of Dr Lally's paper, *The Appropriate Term for the Allowed Cost of Capital*, indicate to APA that Option 1 does not, in general, satisfy the NPV = 0 principle, although in certain conditions deviations from NPV = 0 may be relatively small. In terms of satisfying the NPV = 0 principles, Option 2 seems to lead to a better estimate of the return on debt allowance than Option 1.

If, as the AER advises, the use of weights better aligned with the required level of capital investment reduces any mismatch between the return on debt allowance and benchmark efficient financing cost, we see little rationale for restricting their use to circumstances in which a threshold (large) increase in the regulatory asset base is exceeded. The need to specify the threshold will, as the final working paper notes, raise new issues. In our view, the threshold will ultimately be arbitrary.

Nor can we see a rationale for limiting a more appropriate weighting scheme to electricity transmission network service providers. Large projects, which can substantially impact the regulatory asset base, may not always be restricted to the electricity sector and changes taking place in that sector. As the energy sector transforms, we already seeing changes in electricity distribution (for example, to

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accommodate distributed generation) which are adding significantly to network investment. In gas transmission, we expect some additional investment in pipeline capacity and laterals to support the gas fired-generation as required as backup for the renewables projects giving rise to the need for the larger projects which the Australian Energy Market Operator's current Integrated System Plan anticipates will be undertaken by of electricity transmission network service providers. At a more mundane level, APA has pipelines with compressors which were installed early in the lives of those pipelines and which are now approaching the ends of their economic and technical lives. Replacement decisions will need to be made in respect of those compressors within the next 10 to 15 years, and the potential impact on the capital bases of some pipelines will be relatively large.

Implementation of Option 2 will, we understand, add complexity to cost of debt estimation. However, we think it should be further progressed, from the current conceptual specification in the *Overall rate of return, equity and debt omnibus* final working paper, to a specific proposal which might be implemented through the Rate of Return Instrument.

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***20. Is there another option which better addresses the AER's concern that equal weighting has the potential to distort rates of return on debt allowed to service providers with infrequent and large increases in capital spend?***

Option 2, we think, best addresses the AER's concern that equal weighting has the potential to distort rates of return on debt allowed to service providers with infrequent and large increases in capital spend.

See APA's response to Question 19.

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### 21. *Is there a case for a "tailored" approach to determining returns on debt for regulated firms with temporarily large CAPEX?*

A "tailored" approach to determining returns on debt could be of assistance to regulated firms with temporarily large CAPEX. However, the drafting of such an approach, which was compliant with the requirements of the national energy laws, would be a challenge.

A "tailored" approach to determining returns on debt could be of assistance to regulated firms with temporarily large CAPEX.

However, s. 18J(2) of the National Electricity Law and s. 30E(2) of the National Gas Law both require:

> *If a rate of return instrument states a way to calculate the rate of return on capital or the value of imputation credits, the instrument must—*
>
> *(a) provide for the same methodology to apply in relation to all regulated network service providers in calculating the rate or value; and*
>
> *(b) provide for the methodology to apply automatically without the exercise of any discretion by the AER.*[38]

The drafting of an approach to determination of the rate of return on debt which was "tailored" to regulated firms with temporarily large CAPEX and, at the same time, provided for the same methodology to apply in relation to all service providers would, in APA's view, be a challenge.

[38] S. 18J(2) of the National Electricity Law. S. 30E(2) of the National Gas Law refers, in (a), to all "covered pipeline" service providers.

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### 22. *How would such an approach work under the current law with its requirement for a mechanistic application of the Rate of Return Instrument?*

The requirements of the National Electricity Law and the National Gas Law for the mechanistic application of the Rate of Return Instrument further limit the scope for drafting of an approach to determination of the rate of return on debt which is "tailored" to regulated firms with temporarily large CAPEX.

APA's response to Question 22 follows from our response to Question 21.

On page 96 of the final working paper, *Overall rate of return, equity and debt omnibus*, the AER asks for comment on whether the National Electricity Law should be amended to accommodate a more "tailored" approach. We think such a change might be considered, but only in the context of an overhaul of the rate of return instrument provisions of the National Electricity Law and the National Gas Law. These provisions are, in our view, inflexible, and cannot accommodate responses to changing financial and energy markets.

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***23. Could a threshold level of CAPEX be established so that, if the threshold were exceeded, a different weighting scheme would be applied in the trailing average? Would the use of such a threshold provide opportunities for service providers to "game" return on debt estimation?***

A threshold level of CAPEX could be established so that, if the threshold were exceeded, a different weighting scheme could be applied in the trailing average.

Any pre-specified threshold would, however, be arbitrary, and such an approach is unnecessary.

See APA's response to Question 19.

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## Use of cross checks

### *24. Do you agree with the AER's preliminary position?*

APA agrees that overall cross checks may provide contextual information and/or inform potential areas of inquiry and research and, as such, they may be used to provide an overall sense check of the rate of return.

Before any cross check is used, the way in which it identifies an anomaly which is then attributed to the proposed rate of return should be articulated, and other possible reasons for the anomaly should be identified and controlled.

APA has concerns about the use of RAB multiples as cross checks.

Financeability tests may have a limited role in cross checking the rate of return, but we see little value in scenario testing given the inflexible scheme for the Rate of Return Instrument in the national energy laws.

Other regulators' decisions may have value in providing the AER with an overall sense check, but not in providing alternative estimates of the allowed rate of return.

APA understands the AER's preliminary position on the use of cross checks to be:

- **overall cross checks may provide contextual information and/or inform potential areas of inquiry and research;**
- **as such, cross checks can be used as an overall sense check of the rate of return;**
- **cross checks might include RAB multiples, scenario testing and financeability tests;**
- **historical profitability, investment trends, other regulators' rates of return, and discount rates from practitioners are of less value as cross checks but are to be reported for completeness;**
- **the cross checks which have been examined do not appear to suggest any major concerns with the AER's current approach (the approach of the 2018 Rate of Return Instrument) in respect of the total return provided to investors.**

We agree with the AER that overall cross checks may provide contextual information and/or inform potential areas of inquiry and research and, as such, they may be used to provide an overall sense check of the rate of return.

However, as Mr Hancock advised in his presentation to the fourth of the AER's expert evidence sessions, before any cross check is used the logic underlying its use should be made clear. Before any cross check is used, the way in which it identifies an anomaly which is then attributed to the proposed rate of return should be articulated, and other possible reasons for the anomaly should be identified and controlled.

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APA has concerns about the use of RAB multiples as cross checks. We raise these in our response to Question 27.

As we explain in our response to Question 26, we think financeability tests may have a limited role in cross checking the rate of return. We see little value in scenario testing given the inflexible scheme for the Rate of Return Instrument in the national energy laws (see our response to Question 29).

Having listened to the experts in the fourth of the AER's expert evidence sessions, we think that other regulators' decisions may have value in providing the AER with an overall sense check, but not in providing alternative estimates of the rate of return. Rates of return in other regulators' decisions might be accorded higher standing in the AER's list of possible cross checks. We agree with Professor Partington's comments in the fourth expert evidence session. Comparing methods has merit. "Comparing magnitudes? Pretty dodgy."

We agree that historical profitability, investment trends, and discount rates from practitioners are of less value as cross checks. Reporting on them might facilitate completeness, but is completeness a relevant issue here? They should not be reported.

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***25. Do the cross checks selected provide a balanced assessment that promote the national electricity and national gas objectives?***

APA does not see the use of cross checks as needing to promote the national electricity and national gas objectives.

If, as the AER has indicated, and as the experts generally agreed during the fourth expert evidence session, the purpose of the checks is to provide a sense check on determination of the allowed rate of return, then the cross checks do not need to promote the national electricity and national gas objectives.

A cross check might indicate a different result: a different overall rate of return, a different parameter value, or a different method of estimating a parameter value. If the cross check is used as a sense check, and not formulaically, then, we think, it should cause the AER to ask whether a candidate overall rate of return estimate is the right one. The answer to this question should then feed in to the AER's determination of the allowed rate of return. It is that determination, and not a cross check which may have been carried out in the process of making the determination, which is to promote the national energy objectives.

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### 26. *Which financeability tests should be undertaken?*

APA is of the view that the AER should continue its examination of the ratio of funds from operations to net debt (FFO/net debt) using cash flows from the Post-tax Revenue Model.

We see no role for the regulation of the actual financing operations of individual service providers through some form of financeability test.

The AER's examinations of the ratio of funds from operations to net debt (FFO/net debt) using cash flows from the Post-tax Revenue Model (PTRM) are, as Mr Kumareswaran explained in the fourth expert evidence session, a check on the internal consistency of regulatory decisions. If cash flows are too low to maintain the benchmark credit rating, this signals a potential problem. The forecasts of capital and operating expenditures in the PTRM, and the return on debt, are at the efficient levels. In these circumstances, a potential financeability problem could be indicating that the depreciation allowance is too low, or that the allowed rate of return on equity is too low. The latter is a possibility because the estimation of beta is subject to error, and there are large errors around any estimate of the market risk premium.

Investigation, by the AER, could show that the depreciation allowance was inappropriate, and the problem was not in the proposed rate of return. It could show that the rate of return on equity was too low and should be adjusted upwards by adjusting the estimates of beta and the market risk premium within the limits of the errors of estimation of those parameters. Or, investigation could indicate a larger than normal industry capital program which service providers would need to manage within the financing constraints they faced.

This, we see as the role of a cross check: identification of an aspect of rate of return determination that may require further investigation and modification, without necessarily providing an alternative estimate of the overall rate of return, and without the implication that the rate of return necessarily requires change.

The AER's examination of the FFO/net debt using cash flows from the PTRM is such a cross check and should be continued.

APA, like a number of the AER's experts, sees no role for the regulation of the actual financing operations of individual service providers through some form of financeability test.

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### 27. *How can RAB multiples be adjusted to identify and disaggregate the impact of rate of return from other factors which contribute to the values of the multiples?*

APA doubts whether RAB multiples can be adjusted to identify and disaggregate the impact of rate of return from other factors which contribute to the values of the multiples.

RAB multiples are unsuitable for use as cross checks on the rate of return.

In its December 2021 final working paper, *Overall rate of return, equity and debt omnibus*, the AER defined the RAB multiple as the enterprise value of a regulated firm divided by the regulatory asset base. The enterprise value was determined from:

- **current market - trading - data: the enterprise value was the market value of equity (including any preferred equity), plus the market value of debt, plus any unfunded pension liabilities, less cash and cash equivalents; or**
- **transaction information: the enterprise value was established from the price paid by a buyer when purchasing regulated assets.**

There were, then, two possible RAB multiples: a trading multiple and, if a transaction had taken place, a transaction multiple.

The December 2021 final working paper advised that the AER's preliminary position was that RAB multiples were useful as a trigger for further investigation into the regulatory framework but were unlikely to be able to provide conclusive information on the rate of return unless properly adjusted for the influences of other factors.

Proper adjustment for the influences of other factors was important. A RAB multiple would capture all factors (including those unrelated to the allowed rate of return) which would affect investor valuation of a business. Transaction multiples, in particular, may incorporate quite different views of the future cash flows which could be generated from regulated assets; they could incorporate different control premiums. These premiums would not be incorporated into trading multiples.

Advice from Dr Darryl Biggar, the AER noted, was that careful analysis may be able to "peel away" - that is, isolate and adjust for - the influences of other factors, allowing the regulator to use information from RAB multiples in setting the allowed rate of return.

Dr Biggar, however, offered little in the way of guidance on how this "peeling away" was to be done.[39]

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[39] Darryl Biggar, Understanding the Role of RAB Multiples in Regulatory Processes, 20 February 2018. Available at https://www.aer.gov.au/networks-pipelines/guidelines-schemes-models-reviews/rate-of-return-instrument-2018/initiation.

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In their presentations to the fourth of the AER's expert evidence sessions, Dr Brown and Mr Hancock both advised that RAB multiples might be used in cross checking a proposed allowed rate of return, although a RAB multiple above 1.0 may indicate issues with other regulatory building blocks, and not with the allowed rate of return.

Dr Brown and Mr Hancock also raised the issue that attempting to use RAB multiples in this way would be difficult because service provider businesses comprised regulated and non-regulated segments which were not easily separated.

Mr Kumareswaran agreed with the views of Dr Brown and Mr Hancock noted in the preceding paragraphs. He added:

*There are things contained in the enterprise value component of the RAB multiple that have nothing to do with whether the allowed rate of return is reasonable or not. So I don't think that RAB multiples are a useful cross check, . . .*

Dr Mirrlees-Black was more positive in his views on the RAB multiple:

*So at extremes I think we can say it measures something, and then in the middle it requires nuanced judgement and hard work to assess it. But as a cross check, I think we can say "I think it's there's* (sic) *value in that*.

Professor Partington seemed to agree with Dr Mirrlees-Black. He subsequently observed:

*The AER says it is open to trying to decompose the RAB multiples and I think that it's probably a worthwhile activity. It will be a difficult thing to do, but it's not necessarily impossible and I think it's worth doing even if there is only a low probability of complete success.*

All of this leads APA to conclude that RAB multiples might provide information about whether allowed rates of return are set at appropriate levels, but neither the AER nor the experts know how this information is to be extracted from those multiples. RAB multiples, it seems to us, are unsuitable for use as cross checks on the rate of return.

Furthermore, the issue raised by Dr Brown and Mr Hancock, that drawing information on the allowed rate of return from RAB multiples was made more difficult if service provider businesses comprised regulated and non-regulated segments which were not easily separated, was not further addressed in the fourth expert evidence session. Our view is that any attempt to separate the actual or forecast financial performance of a service provider business into regulated and unregulated segments will involve inherently arbitrary allocations of costs and, to a lesser extent, of revenues, which will preclude any clear conclusions from analysis of the RAB multiple.

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We doubt whether RAB multiples can be adjusted to identify and disaggregate the impact of rate of return from other factors which contribute to the values of the multiples.

Perhaps, though, we should have regard to the view of Dr Mirrlees-Black that the question around whether RAB multiples can be used might be an empty question. Dr Mirrlees-Black, in his comments at the fourth expert evidence session, advised that, within a few years we may not have any data from which to draw any inferences. APA thinks we are close to that being the case today: APA remains the only listed service provider business with fully regulated gas pipeline assets.

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### *28. Should the AER give priority to transaction RAB multiples or to trading multiples?*

RAB multiples, in APA's view, are unsuitable for use as cross checks on the rate of return.

The question of whether priority is to be given to transaction multiples or trading multiples does not arise.

See APA's response to Question 27.

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### 29. *What scenarios should be considered to ensure a balanced assessment of possible outcomes from a rate of return decision?*

APA sees little value in testing possible proposed rates of return under various scenarios unless the AER has the intention of including in the Rate of Return Instrument rules which would allow the rate of return to change should conditions change.

APA sees little value in testing possible proposed rates of return under various scenarios unless the AER has the intention of including in the Rate of Return Instrument rules which would allow the rate of return to change should conditions change.

Fixed rules, applying over the four years of the Instrument, and allowing different rates of return in different circumstances, may not be easy to formulate, and the national energy laws (National Electricity Law, s. 18J(2); and National Gas Law, s. 30E(2)) explicitly preclude any discretionary intervention by the AER.

As we are finding with proposals to adjust the MRP in response to future changes in the estimate of the risk free rate of return, financial economics may provide only limited guidance on the form of the relevant rules. In the absence of that guidance, we are left reliant on purely empirical relationships, which may or may not continue to hold.

Scenario testing could be useful, but only if the national energy laws were amended to provide a regime for the Rate of Return Instrument which recognized uncertainty.

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***30. The Energy Networks Association has proposed a scheme of scenario testing: what comments do you have on this scheme?***

In a more flexible statutory regime, a scheme of scenario testing such as that proposed by Energy Networks Australia (including the scenario testing model), could, in APA's view, provide guidance for establishing the Rate of Return Instrument.

See APA's response to Question 29.

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## Five additional questions

### *31. Should hybrid securities be included in the assessment of benchmark gearing?*

When determining gearing the AER should not adjust debt and equity to recognise hybrid securities. A simple debt/equity balance sheet structure should be retained.

Ausnet Services and Spark Infrastructure have issued hybrid securities.

These hybrid securities have some of the characteristics of debt, and some of the characteristics of equity. The issuance of hybrid securities is typically limited to larger borrowers financing in international capital markets, and these markets are not always "open" for new issues of such securities.

The way in which the characteristics of debt and equity are combined in a particular issue of hybrid securities is specific to that issue. There is no simple method whereby the value of hybrid securities can be allocated between debt and equity.

In these circumstances, APA does not see hybrid securities as forming part of the portfolio of financing instruments used by a benchmark provider providing services using assets regulated under the regimes of the National Electricity Law and the National Gas Law.

When determining gearing the AER should not adjust debt and equity to recognise hybrid securities. A simple debt/equity balance sheet structure should be retained.

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### 32. *Should the benchmark gearing be adjusted to more closely align with market data?*

The current benchmark gearing of 60% should be retained for the Rate of Return Instrument 2022.

In previous reviews of the allowed rate of return, experts have advised, and stakeholders (including APA) have accepted, that market values of equity and debt provide the correct measure of gearing. The book values of these financing instruments are historical and of little relevance to current resource allocation decisions. Market values, not book values, are consistent with the theory of financial economics. Although market values of equity are relatively easily calculated from current share prices, market values for corporate debt, which is not extensively traded, are more difficult to obtain. APA concurs with the current approach of estimating gearing from market values of equity and book values of debt. The gearings noted in the following paragraphs have been calculated in this way; they have not been calculated from book values.

The gearing benchmark, set in 2018, was 60.0%. It was based on the gearings of nine businesses: Alinta, AGL, APA Group, Diversified Utility and Energy Trust, Envestra, GasNet, Hastings Diversified Utilities Fund, SP Ausnet (now AusNet Services) and Spark Infrastructure.

Table 2 of the AER's *Rate of return: Annual update* (December 2021) shows that, by 2018, data were available for only three of these businesses: APA Group, AusNet Services and Spark Infrastructure. If the gearing benchmark is now to be realigned with current market data, that realignment will be determined by the data for only three businesses. Two of them - AusNet Services, and Spark Infrastructure - seem similar, with gearings, since 2018, between 55% and 59%. The third of the remaining entities - APA Group - has had gearing between 45% and 49%.

Table 2 also sets out average gearings for periods of 5 years and 10 years. The average gearings for AusNet and Spark Infrastructure are similar: the averages over 5 years are 56% and 57%, respectively. Over 10 years the averages are both 57%. These are to be compared with the corresponding average gearings for APA Group of 47% (5 years) and 47% (10 years).

In terms of gearing, AusNet Services and Spark Infrastructure are quite similar. They are very different from the much lower geared APA Group.

The data for APA Group, AusNet Services and Spark Infrastructure cannot be regarded as similar but with some random variation which can be dealt with by averaging.

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A larger sample could help, and should be considered in a review leading to the 2026 Rate of Return Instrument.

At the present time, the data seem to be indicating that:

- gearings for AusNet Services and Spark Infrastructure have not changed much, and remain close to the current (2018) benchmark;
- APA Group gearing has not changed much either, but has persistently differed, by around 10%, from the current (2018) benchmark.

In these circumstances, the current benchmark gearing of 60% should be retained for the Rate of Return Instrument 2022.

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### 33. *Should the AER continue to assume that non-resident investors assign no value to imputation credits?*

The current assumption that non-resident investors assign no value to imputation credits should be retained.

The current assumption that non-resident investors assign no value to imputation credits is based on the provisions of Australian taxation law which limit the claiming of tax offsets for franking credits attached to distributions to Australian resident tax payers.

APA is aware that, at least since the review of the tax system by Dr Henry in 2010, proposals have been made for changes to the dividend imputation provisions. However, during consultation on the 2022 Rate of Return Instrument, no evidence has been put forward for either an imminent change in tax policy, or for a change to the assumption that non-resident investors assign no value to imputation credits.

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***34. Are there debt data providers other than the Reserve Bank of Australia, Bloomberg and Thompson Reuters which should be considered for determining benchmark costs of debt?***

APA has no proposal for adding to the existing list of debt data providers.

Other debt data are available, although some is for specific purposes and may not be suitable for use in determining regulatory benchmark costs of debt.

APA has regularly made use of debt data from the Reserve Bank of Australia, Bloomberg and Thompson Reuters for regulatory and for other purposes. We have come to value the consistency in these data over time.

We have no proposal for adding to the existing list of debt data providers.

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***35. Are there any improvements or changes that can be made to the application of the return on equity cross checks at the point of making the 2022 Rate of Return Instrument.***

APA is of the view that a careful specification of the approach to allowed rate of return determination, including specification of the approach to rate of return on equity estimation, which we think the AER has sought to achieve, limits the scope for subsequent cross checks.

Our responses to Questions 24, 25, 26, 27, 28, 29 and 30 indicate that we see cross-checks as having a limited role in determining the allowed rate of return.

The only real cross-check, in our view, would be provided by another method, or set of methods, carefully applied, producing another estimate of the allowed rate of return which can be compared with the rate resulting from the approach the AER proposes to adopt for the 2022 Rate of Return Instrument.

APA is not aware of such a method, or set of methods, which might stand credibly against the AER's currently proposed approach.

Although we are not aware of another comprehensive approach to estimating an allowed rate of return, there are alternatives to particular elements of overall rate of return determination. Cross checks might be made on the return on equity at the point of making the 2022 Rate of Return Instrument by using any of the alternatives to the CAPM including the dividend growth model, Fama-French type factor models, the intertemporal CAPM, and arbitrage pricing models. However, these models have been removed from consideration at an earlier stage when deciding to proceed with the CAPM.

APA is not proposing that the debate about alternative equity models be re-opened. We suggest only that a careful specification of the approach to allowed rate of return determination, including specification of the approach to rate of return on equity estimation, which we think the AER has sought to achieve, limits the scope for subsequent cross checks.