South Australian Centre for Economic Studies

Review of issues raised by Frontier Economics in connection with *Ausgrid's* 2019-24 regulatory proposal

Final Report

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1. Introduction

Ausgrid has made a revenue proposal to the Australian Energy Regulator (AER) in connection with its 2019-24 regulatory period. Its proposal includes a report that Ausgrid commissioned from Frontier Economics (2018) entitled *Estimation of certain aspects of the regulated rate of return*. The Frontier report was prepared by Dr Stephen Gray, who is Professor of Finance at the University of Queensland Business School.

Energy Consumers Australia has commissioned the South Australian Centre for Economic Studies (SACES) to prepare a very short expert report on matters raised in the Frontier study. This SACES report has been prepared by Mr Jim Hancock, Deputy Director.

Many of the issues raised by Frontier have recently been discussed during the AER's consultations over the preparation of its 2018 Rate of Return Guideline. As part of those consultations the AER held two expert evidence sessions in March and April 2018. In the first session, experts discussed discussion papers relating to gearing, financial performance measures, and risk and judgement. In the second session experts discussed gamma, equity beta, and MRP (market risk premium), risk free rate averaging period and automatic application. The agenda of the second session—which the author Jim Hancock attended as an expert—is closely related to the matters covered by Frontier. Then, in July 2018, the AER released *Draft Guidelines*.

The *Draft Guidelines* address key issues arising in Frontier. Among other things, they propose:

- a risk free rate based on an average of synthetic 10-year Commonwealth bond rates;
- an equity beta of 0.6;
- a market risk premium of 6 per cent; and
- a gamma of 0.5.

It is possible that some of the matters presently under consideration by the AER in the Ausgrid decision will be resolved by a proposed "binding rate of return instrument". The instrument has been proposed by the COAG Energy Council and draft legislation to give effect to it has been published but has not at this stage been enacted. However, as the instrument has not been brought into force, and may not be, this submission addresses Frontier's work on the Ausgrid proposal under the assumption that no binding instrument is in place.

This review of Frontier proceeds in line with the chapter structure used by Frontier. It draws on the discussions in the second expert evidence session and in particular on the *Expert Joint Report* that was prepared by Cambridge Economic Policy Associates (2018) and also on the recent *Draft Guidelines* (AER 2018a).

2. Equity beta

Frontier's main conclusions are:

- Frontier says that in a series of decisions, the AER has explained that:
  - (a) It considers the "best empirical estimate" of beta to be 0.5; and
  - (b) The allowed beta is to be set to 0.7 due to three additional considerations:
    - (i) "international estimates" – the fact that the weight of evidence from international comparators supports a beta estimate materially above the AER's domestic starting point estimate of 0.5;
    - (ii) "consideration of the theory of the Black CAPM" – the fact that the Black CAPM evidence is that the unadjusted SL-CAPM will systematically understate the required return on low-beta stocks; and
    - (iii) "investor certainty" – the fact that instability in equity beta allowances may cause investors to increase their assessment of regulatory risk." [pp. 4-5]
- Frontier says that on the available evidence the "best empirical estimate" of beta has increased to 0.7.
- Beta estimates for regulated network comparators that have delisted are increasingly out of date and they cannot pick up on movements in beta since delisting.
- Beta estimates have increased since the 2013 Guideline for the listed regulated energy network comparators and for other relevant comparators.
- Continued application of the 2013 Guideline approach with allowance for the latest "best empirical evidence" supports a beta of at least 0.7.

SACES Response:

1. AER (2017) explicitly rejects Frontier's characterisation of its decision process on beta. It says

   > "Frontier has mischaracterised our approach for equity beta. We do not uplift the equity beta to 0.7 (from 0.5) to account for the low beta bias. We select a top of the range value of 0.7 (from a range of 0.4–0.7) to account for the theory of the Black CAPM and other relevant information." [pp. 3-67]

   It goes on to say that it uses a 2014 report by Professor Olan Henry to inform its beta decision and that

   > "we give most consideration to empirical Australian estimates of suitable comparator firms (Australian energy network firms) which indicate a range of 0.4–0.7 … Our consideration of the theory of the Black CAPM and international estimates (which we give less consideration) suggest a point estimate towards the upper range. These considerations along with our consideration of investor certainty lead us to set a point estimate of 0.7." [p. 3-165]

2. The 2013 Guideline adopted a value of 0.7 for beta, which was at the top end of its identified range.
3. When it chose the beta value of 0.7, the AER was mindful that its existing practice was to use a value of 0.8, and it was concerned that it should not make too large adjustments to the beta parameter. It wanted to adjust parameters gradually so as to minimise perceptions of regulatory risk. With the passage of 5 years since the 2013 Guideline, it is consistent with that gradualist approach for the AER to now adjust beta lower if it believes that the best estimate is lower than 0.7.
4. Since the Henry (2014) report was prepared there has been a reduction in the number of listed Australian energy networks and this complicates the task of estimating contemporary betas for energy networks. The number of listed Australian regulated networks has fallen from 9 at the time of the Henry study to 4 at the time of the last AER analysis and to 3 today. The AER could base its beta estimates on the remaining 3 listed entities but this is a fairly thin dataset.
5. Frontier analyses betas for the 4 entities that were listed at May 2017. It finds that the central point estimates of beta for a portfolio of these entities have risen. However, it does not address whether the changes are statistically significant.
6. There are two primary approaches to augmenting the beta observations available to AER. First, one could come up with new comparators and directly impute the regulatory beta from the observed betas on the new comparators. Secondly, one could combine the historical beta estimates for regulated energy networks with an estimate of change in beta based on a set of comparators that has the necessary data to carry out a matched sample comparison of betas at different points in time.
7. An example of the first approach is the proposal by Frontier to consider betas for a set of transport-related Australian infrastructure firms that Frontier says have common characteristics to the Australian regulated energy networks. Frontier finds that these entities have betas which are materially higher than the AER's current beta of 0.7 and argues that "if this evidence were to be afforded any weight, the result would be an increase in the equity beta allowance" [p. 27]. In our view, the fact that these beta estimates

for the transport sector are higher primarily suggests that they may not be a very good comparators for the regulated energy networks.

8. A second example of finding new comparators is the suggestion made from time to time that the AER should use betas estimated overseas for comparable firms. It seems to us that this approach is fraught with problems. One problem is that the nomination of a relevant comparator group is highly judgmental. The discussion of evidence from international comparators in AER (2013b) shows that there is a quite wide range of levels for the beta estimate depending on: which firms are regarded as comparators; what time period is used to observe the comparators; and the method used to aggregate comparators. Even if one focuses on regulated energy networks, there are remaining questions about the comparability of the regulatory frameworks and approaches to their application, differences in the surrounding institutional frameworks, exposures to worker pension liabilities and assets held against them, etc. A second problem is that beta estimates also depend on the market portfolio that is used as a benchmark for covariance calculations. If, as is widely believed to be the case, the Australian market on average is rather more volatile than international markets as a result of compositional factors such as Australia's exposure to resource industries, then betas for Australian regulated networks on the Australian market might quite plausibly be lower than the betas calculated for, say, US regulated networks on the US market.

9. The alternative of tracking changes in beta is also problematic, in this case because the data tend not to provide much strong evidence of sustained changes in betas. Analyses appear to be quite vulnerable to shifting the start and end points of the data series used in analysis. AER (2018b) presents average annual betas for the Australian utilities sector which show an average beta of 0.63 for the 5 years to 2017 compared with 0.5 for the 5 years to 2012. But the difference appears not to be statistically robust. The point is illustrated by noting that, notwithstanding the higher average of the past 5 years, as recently as 2016 the recorded beta for the utilities sector was 0.4.

10. It is clear from the estimates that betas fluctuate over time. But this does not mean that the latest observation tells us very much about what betas to expect in the coming few years. Unless one can establish evidence of random walks or trends in the data then we should not put too much weight on the latest observation; rather we should regard it as one more piece of evidence to assist with estimating the noisy random variable beta.

11. In its *Draft Guidelines* the AER says that the empirical evidence "supports an empirical range of 0.4–0.8 with clustering in the 0.5–0.6 range. We consider our comparator set of domestic firms is the best empirical guide currently available" [p. 243]. The AER also says that one factor behind its decision to hold beta at 0.7 in the 2013 Guidelines was that while a more substantial downward adjustment was probably warranted on the data by itself, a more gradual approach to adjustments was desirable in the interests of investor certainty. The AER says that it is consistent with that gradualist approach to now move beta lower if the evidence warrants it.

12. Our conclusion is that Frontier's call to increase the beta estimate from the AER's existing norm of 0.7 is not convincing. If beta were revised downward modestly from 0.7 this would take it closer to the middle of the range of beta estimates that have been made over the years while maintaining a gradualist approach to adjustment.

3. Low-beta bias

Frontier's main conclusions are:

- The phenomenon of low-beta bias is a standard phenomenon that is covered in textbooks.
- The majority of studies support an estimate of the zero-beta premium between 2% and 4%. This is slightly above the range of 1.5% to 3% that was nominated by the AER as "reasonable" and "open to us" in its 2013 Guideline.
- The AER says that it allows for low-beta bias by making an upward adjustment to the equity beta in the SL-CAPM. The adjustment that the AER makes is consistent with zero-beta premium of at most 2.6% and Frontier concludes that the AER's approach "does not appear to fully correct for low-beta bias. A full correction for the observed low-beta bias would require a greater uplift to the statistical beta estimate than that which the AER has adopted in recent decisions" [p. 39].

SACES Response:

1. Much of the evidence that Frontier presents in support of low-beta bias relates to the US.
2. Although the two Australian empirical studies[1] are suggestive that the zero-risk premium is greater than zero, they certainly are not conclusive. There are questions as to the robustness of statistical tests used in the studies. And ignoring those questions, the estimates taken at face value have such wide error margins that conventional 95 per cent confidence testing would seem to admit any estimate within plus or minus 10 percentage points of the authors' central estimates. See Box 1 for further discussion.
3. Professor Kevin Davis' (2011) expert advice to the AER regarding the Black Scholes model and its implications for Australian regulatory decisions remains relevant. Davis notes inter alia that:
   - there is a theoretical basis for SL-CAPM and one should be wary of preferring atheoretic specifications on the basis of empirical studies which have ambiguous interpretations;
   - tests of the SL-CAPM rely on an assumption of market efficiency, and when the test is rejected it is possible that mean-variance efficiency rather than SL-CAPM is what is rejected;
   - neither beta's nor expected returns on stocks are actually observed and they are instead proxied with historic realisations, which may go some way to explaining the poor empirical performance of SL-CAPM ;
   - restrictions on financing that are allowed for in the Black CAPM do not seem large enough to justify the magnitudes of estimates of the zero-risk premium; and
   - test statistics that are relied on in many studies are not valid, leading to unwarranted rejections of SL-CAPM.

   In our view these arguments remain valid today.
4. In conclusion, we are not convinced of Frontier's claim that the AER makes inadequate adjustment for low-beta bias. In fact it is possible that the current allowance goes too far. There is no convincing argument to increase the existing allowance for low-beta bias.

Box 1: Estimates of the zero-beta premium in Australia

NERA (2013) present a number of alternative estimates of the zero-beta premium using Australian data. Their central point estimates are extraordinarily high—e.g. for the case of a portfolio using data from 1974 to 2012 they estimate a 13.95 per cent zero-beta premium which would mean that a zero-beta portfolio could be expected to earn 14 per cent in excess of the bond rate. The standard errors on their estimates are also very high at 5.48 per cent and, using a rough rule of thumb, they suggest a confidence interval of plus or minus 11 per cent around that central estimate. On the basis of this NERA conclude that the hypothesis "zero-risk premium equals market risk premium" would not be rejected for any of the commonly discussed values of the MRP. And they conclude that the hypotheses of "zero premium over the bond rate" is rejected. However, in my view it is questionable whether very much can be taken from the NERA results, as they are very imprecise. That concern is reinforced when one takes into account that the estimation of standard errors in a setting like this is not straightforward and the risk is that the standard errors are even larger than estimated. For example, the authors give no indication that they have adjusted their results to make them robust against heteroscedasticity yet this is likely to be a problem in the modelling of security prices. In conclusion, probably the most that can be drawn from NERA's results is that they suggest that the zero-beta premium in Australia is non-zero, but with the use of a model that is imprecise and at risk of misspecification.

SFG estimate the zero-beta premium in a model that seeks to control for the influence of book-to-market ratios (BMRs). They do this by selecting stocks to portfolios on the basis of industry, size and BMR. SFG report that on their most basic specification "The zero-beta premium … is 3.34% per year". Yet this is only a central point estimate and using the

[1] NERA (2013) and SFG Consulting (2014).

standard errors published by SFG shows that the conventional 95 per cent confidence interval ranges includes zero. (SFG report a 90 per cent confidence interval, and by this device have a confidence interval that does not include zero.) And none of the other specifications that the authors consider give a more convincing case for a zero-beta premium in excess of zero. There are also unexplained aspects of SFG's analysis, such as how standard errors have been adjusted to allow for the overlapping data structure that SFG employed, robustness to heteroskedastic data generating processes, etc. In conclusion, this study covers essentially the same data as NERA and does not produce any more compelling evidence in favour of a substantial zero-beta premium.

4. Market Risk Premium

Frontier's view:

- The historical excess returns data—considered over 5 averaging periods with a varying amount of history—support an MRP in the range 6.0% to 6.5%.
- Frontier argue that the total required rate of return on equity has not fallen along with real interest rates in recent years.
- Application of the Dividend Growth Model (DGM) suggest an MRP range of 7.14% to 8.18%.
- The preponderance of evidence indicates that the MRP has increased since the AER's Guideline.
- Market evidence indicates that a reasonable estimate of the MRP is at least 7%.

SACES response:

1. It is quite consistent with the theoretical underpinnings of the MRP that it may vary through time. For instance, theoretical considerations imply that changes in perceptions about the riskiness of the market should cause the MRP to change.
2. Models to estimate the MRP suffer from high variances—i.e. imprecision—and the best way to deal with this is to have more observations. This means that it is desirable to have a long series of returns to estimate the MRP.

   While structural models that estimate a time-varying MRP—possibly contingent on other variables—are reasonable in principle there has not been much success finding time-varying models that convincingly outperform simple averages of historical data.

   We acknowledge that it will at times be appropriate to make adjustments to raw data when there are strong in-principle arguments for it, even if those arguments are not statistically testable. An example is adjusting historical excess returns from 1988 onward to allow for the value of franking credits distributed.
3. Historical averages of 1-year excess returns over the bond rate—inclusive of the value of franking credits—are in the range 6.0% to 6.5%.
4. An important issue which has not yet received the attention it deserves is that the emphasis on 1-year return horizons leads to higher MRP estimates than when a longer horizon is considered. Average annual returns calculated from a sample of multi-year intervals are lower than the average annual returns calculated on a sample of 1-year intervals—see Appendix A.

   There should be no presumption in favour of a 1-year horizon. The CAPM says nothing about the horizon that should be modelled. The use of an average of 1-year returns is simply a default outcome that reflects common practice and an implicit assumption that the return duration does not matter. But multi-year durations are more relevant than 1-year durations for network regulation and efficient network investment signals because network investments have lives of many years.

   The building blocks calculation of return on equity actually uses a 10-year risk free rate, and while this is not determinative of the analysis horizon it does tend to confirm that a lengthy investment horizon is relevant for network investment decisions.

   Taking these concerns into account, the historical data suggest an MRP—inclusive of the value of franking credits—in the range 5% to 6%.
5. The question of what length of analysis horizon to use also touches on the debate about whether to use arithmetic or geometric averages of data. In general an arithmetic average of 1- year returns will be a better estimator of a 1-year return than a geometric average over a multi-year period. But a compound of the arithmetic average of 1-year returns will not be a good estimate of the expected return on an investment with a life of several years and it will in fact tend to exaggerate the expected return. Although the arithmetic average of 1-year returns has good credentials as an estimator of average 1-year returns, this does not mean that it has good credentials as an estimator of required returns for long-lived assets.
6. Frontier's claim that the required rate of return on equity has not fallen one-for-one with bond rates is equivalent to saying that the MRP has risen in recent years.

   Neither the CAPM nor mainstream theories of the consumer and the firm provide any rationale for a negative correlation between MRP and bond rates. But we acknowledge that this still leaves open the possibility that a correlation exists.

   If a correlation between MRP and bond rates exists, then a correlation between historic excess returns and bond rates should exist too. We regressed excess returns on bond rates using the AER's long series of annual excess returns which has 135 annual observations. We find no evidence of a statistically significant relationship—Appendix B. However, we acknowledge that the data lead to a test with very weak power; they do not reject the competing hypothesis that the MRP moves inversely one-for-one with bond rates.

Frontier points to estimates of the required rates of return on equity in support of its argument that they have not fallen in line with bond rates. But they are only estimates and these estimates are constructed using DGM models which at any point in time typically assume that required rates of return on capital are constant into the future (see Lally 2013). That very assumption is likely to impart stability to the series of total return estimates. The apparent stability of required rates of return in the face of fluctuations in bond rates may in fact be an artifice of the method used to estimate required total rate of return.

7. The fact that Frontier's DGM-based range for the MRP is so much higher than the range based on historical excess returns invites the question as to why the divergence arises. We do not have the data to carry out the reconciliation, but the likely answers relate to the structure of DGM estimates and to the parameter assumptions used by Frontier.

   When the DGM is applied conventionally, it solves for a stable-through-time cost of equity. An MRP estimate that is calculated residually by deducting a bond rate will then fluctuate inversely to the estimated required rate of return on equity. As was argued in the previous point, there is neither theory nor empirical evidence to support the assumption that MRP does fluctuate inversely with the bond rate.

   On the matter of parameter assumptions, we note that Frontier's central DGM scenario employs a 4.6 per cent growth assumption which is consistent with the 4.6 per cent scenario put forward in Lally (2013). Lally's assumption was based on 3.0 per cent real GDP growth, 2.0 per cent real growth in dividends per share and 2.5 per cent CPI. While a 3.0 per cent GDP growth rate is probably reasonable for today's outlook, dividend payout ratios in Australia have been high over the last decade—notwithstanding with some apparent reduction over the last two years or so—and this has potentially undermined prospective growth rates for dividends per share.

   In our view Frontier's DGM estimates of required return on equity—indeed any DGM results—should be viewed as highly judgmental. DGBM estimates have the potential for significant departures—upside and downside—from the true but unobservable required returns on equity. Moreover, they carry an implicit assumption that MRPs move up when bond rates fall (and move down when bond rates rise) but this supposition is supported neither by theory nor by the empirical evidence..

8. In conclusion, we believe that the AER should take account of the fact that its regulatory rate of return is intended to guide long-lived investment decisions and that estimates of annual returns based on long durations are appropriate. Estimates based on historical averages are more appropriate than estimates based on DGM. It is appropriate to adjust the historical average data where there are strong a priori grounds for doing so and on this basis the MRP estimate should—as is the case in the AER calculations—take into account the value of franking credits distributed. In view of these factors an MRP in the middle of the range 5% to 6½% is warranted. The MRP of 6 per cent that the AER proposes in its *Draft Guidelines* seems reasonable although perhaps conservative towards the high side.

5. Gamma

Frontier's view:

- There is broad agreement that γ should be interpreted as the product of a distribution rate F and a second parameter θ, i.e. $\gamma = F \times \theta$.
- Frontier believes that θ should be set equal to the "value of distributed imputation credits" and opposes the existing AER approach which is to equate θ with the "utilisation rate".
- Frontier says that the AER's use of the "redemption" or "utilisation" approach to calculating gamma results in "an internally inconsistent implementation of the regulatory model whereby investors are properly compensated for all personal taxes and costs that apply to dividends and capital gains, but not compensated at all for the additional personal costs that apply to imputation credits" [p. 169].
- Frontier says that if a calculation gamma is made using the redemption approach then acknowledged deficiencies with the ATO data are not a problem because the errors cancel out in the calculation. The ATO data support a redemption-based gamma estimate of 0.34.

SACES response:

1. The role of θ is to make an estimate of γ using the formula $\gamma = F \times \theta$. The estimate of γ is used to adjust the corporate tax element in the building blocks calculation of cost of capital. The corporation tax payments by the entity—which are made at the statutory tax rate t—are discounted to allow for subsequent refunds against franking credits. The amount that is refunded depends on the distribution rate and the utilisation rate. This interpretation is made clear in, for instance, clause 6.5.3 of the National Electricity Rules (v. 111) which says

   "The estimated cost of corporate income tax of a Distribution Network Service Provider for each regulatory year (ETC_t) must be estimated in accordance with the following formula:

   $$ETC_t = (ETI_t \times r_t)(1 - \gamma)$$

   where:

   ETI_t is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of standard control services if such an entity, rather than the Distribution Network Service Provider, operated the business of the Distribution Network Service Provider, such estimate being determined in accordance with the post-tax revenue model;

   r_t is the expected statutory income tax rate for that regulatory year as determined by the AER; and

   γ is the value of imputation credits." [p. 765]

   In our view it is entirely consistent with the Rule to identify θ as a utilisation rate and this is the view of the Federal Court. If θ is set at the utilisation rate then ETC_t represents the corporation tax paid to the ATO net of the credits granted against it.

2. The return on an equity comprises three benefit streams: capital gains on the disposal of an equity, dividends paid and imputation credits distributed. An investor may value a dollar delivered through these income streams differently, for instance as a result of different tax treatments (e.g., for an Australian resident capital gains are likely to be taxed at lower rate than dividends), transaction costs and administration costs. One empirical investigation of these issues is Frontier (2016) and the results of their Model 4 indicate that $1 of dividend is on average valued at $0.91 of capital gain and $1 of distributed imputation credits is valued at $0.36 (which on the basis of a utilisation rate of 0.6 would imply a value of 60 cents in the dollar for utilised imputation credits).

3. Frontier's assertion that there is an inconsistency in the treatment of, on the one hand, dividends and capital gains and, on the other hand, franking credits, is misleading. It is possible that capital gains and dividends have different "market values"—and as noted in the previous point Frontier has previously claimed that they *do* have different market values—yet the AER makes no allowance for this. In particular, the historical excess returns data that are calculated by AER and used as the primary basis for determining MRP comprise dividends valued at $1 in the dollar, capital gains valued at $1 in the dollar, and imputation credits valued at 60 cents in the dollar (based on 60 per cent utilisation). A similar issue arises with respect to the DGM: the DGM estimate of the cost of capital is calculated purely with reference to dividends exiting the entity and without regard for the different valuations that investors may place on dividend and capital gain benefits.

4. The AER's existing treatment is by implication one in which benefit streams to stockholders from an entity are valued ex the entity and gross in the hands of the stockholder. The various costs that are incurred by the stockholder in realising and administering those gross benefit streams undoubtedly impact on the net benefits accruing to the stockholder but because the AER is not focussing on the net

benefit streams it does not use market valuation data to mark down the gross benefits. It is consistent with this view that θ be regarded as a pure utilisation rate.

5. In our view it seems desirable that there be a consistency between the way that benefit streams—capital gains, dividends and franking credits—are aggregated to estimate the MRP and the parameter values that are adopted elsewhere in the WACC.

6. It is acknowledged, including by Frontier we think, that there are substantial quality problems with the ATO data on franking credit distributions. We agree with Frontier that so long as one has good data on franking credits created and franking credits claimed, this should not matter if the objective is to estimate gamma for the universe of entities in the ATO tax collection. This is so because the estimate of franking credits distributed then cancels out in the calculation of gamma. With this in mind Frontier says that the ATO data support a redemption-based gamma estimate of 0.34.

7. Frontier expresses confidence that the ATO franking credits created and franking credits claimed data are of good quality and also implies that they are well suited to the calculation of gamma. We are unsure about the quality of the ATO data for these items. While we are sympathetic to Frontier's view that the ATO should have reliable data we would say the same for franking credits distributions, and the deficiencies in the distribution data bring into question the quality of the other data. The fact that the ATO seemingly *should* have good data does not convince us that it actually *does* have good data.

8. There is also a question as to whether the entities in the ATO collection are a suitable benchmark for estimating gamma. Given the emphasis on estimating WACC parameters from observable data for listed companies, there is a case for seeking to confine gamma to listed companies. There is also a case for confining the estimate to large companies and perhaps also to companies in the same industry sector as the regulated network entities.

9. We note that in its recent *Draft Guidelines* for rate of return the AER (2018a) has taken a distribution rate of 0.83 and a utilisation rate of 0.6 and arrived at a gamma value of 0.5. The distribution rate assumption takes into account: Professor Lally's finding of a distribution rate of 0.88 from the financial reports of the top 20 ASX listed firms; a distribution rate of 1 for comparators from the same industry as the BEE [p. 397]; and ATO data suggesting distribution rates, over all equity, of either 0.76 (FAB basis) or 0.57 (dividend data basis). The AER says that its assumed utilisation rate is slightly lower than is suggested by ABS data on equity ownership (foreign versus domestic owner shares).

10. On the basis of these considerations, we feel that the AER should use a utilisation-based estimate of θ and should use distribution rate data observed from appropriate ASX-listed comparator firms. The gamma estimate of 0.5 in the *Draft Guidelines* is reasonable in light of these considerations.

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Appendix A

Duration of investment horizons used to estimate MRP

It is conventional to address the discussion of MRP using data on 1-year excess returns. But this is just for convenience and in fact the CAPM says nothing about the length of the return period. There is probably also an implicit assumption that the return horizon used to calculate excess returns does not matter, but in fact it does.

It is natural to wonder whether the length of the return period matters. Under some circumstances—such as independently, identically distributed excess returns—the length of the investment horizon will not matter. But under other circumstances—such as autocorrelation in the data—it does make a difference. Whether this is true of the Australian excess return series is an empirical question.

Table A.1 presents average excess returns inclusive of the utilised component of the franking credit yield. The underlying data are from the AER's excess return dataset.[2] I have considered the period 1897 to 2017 on the grounds that this uses nearly all of the available historical and that it supports segmenting the dataset into periods of 1, 5, 10, 20 and 30 years. The average 1-year excess return is 6.4 per cent. But on the longer return periods the average annual return is always below 6 per cent. The 5-year, 10-year and 20-year return estimates are all in the 5.5 to 6.0 per cent range. Moreover, the sample standard errors on these multi-year returns are actually lower than the sample standard errors on 1-year returns, notwithstanding that there are more observations in the calculation of average 1-year returns. The 30-year average excess return of 4.3 per cent has a much higher sample standard error and should on that basis be ruled out.

All of the averages in Table A.1 are sufficiently close that the apparent differences are not statistically significant. But there is no good reason, other than convention, to prefer the average on 1-year returns. The sample standard errors do give some indication of precision, and on that basis the 20-year return is perhaps the best estimate, giving an average annualised excess return of 5.8 per cent.

Table A.1 Average excess returns for the period 1897 to 2017[a]

		Excess return		Excess return plus franking credits[b]	
	Observations	Average	Sample standard error	Average	Sample standard error
1 year	120	6.2	1.5	6.4	1.5
5 year	24	5.3	1.3	5.6	1.3
10 year	12	5.3	1.2	5.6	1.1
20 year	6	5.5	0.7	5.8	0.7
30 year	4	4.0	2.6	4.3	2.4

Notes: a Averages are calculated using non-overlapping periods.
b Calculated with $\theta = 0.6$
Source: SACES calculations.

[2] The AER has taken data from Brailsford, Handley and Maheswaran (2012) and has supplemented it with data for 2011 to 2017. The AER has also added an income stream calculated as 60 per cent of distributed franking credits.

Appendix B

Correlation between MRP and bond rates

Let MRP_t be the time-varying market risk premium which is generated by the process

$$MRP_t = \alpha + \beta BR_t + u_t$$

where BR_t is the bond rate and u_t is a random disturbance with mean zero. α and β are parameters of the process and we wish to test the hypothesis $\beta = 0$.

An immediate difficulty is that we cannot observe MRP_t, but we can observe ER_t which is related to MRP_t by

$$ER_t = MRP_t + v_t$$

where ER_t is the excess return in period t and v_t is a random disturbance which we assume has mean zero. Therefore we can rewrite the regression equation as

$$ER_t = \alpha + \beta BR_t + u_t - v_t.$$

Clearly the term $u_t - v_t$ has mean zero. Then so long as $u_t - v_t$ is uncorrelated with the bond rate BR_t a linear regression of ER_t on BR_t will gives us an unbiased estimate of β, which is the impact in percentage points of a 1 percentage point change in the bond rate.

We used the AER's (2018b) series of excess return and bond rate observations for the period 1883 to 2017. The excess returns are adjusted to include franking credits based on a 60 per cent utilisation of distributed credits. There are 135 observations.

The results in Table B.1 show that the hypothesis $\beta = 0$ cannot be rejected with these data and this specification. To reject the null hypothesis at the conventional 5 per cent threshold we would need a p-value of 0.05 or less. With each of the three approaches used to estimate standard errors the p-values are far in excess of 0.05.

The conventional standard error calculation is appropriate so long as the $u_t - v_t$'s are independently, identically distributed (i.e. homoskedastic, no serial correlation). The White standard errors are asymptotically robust so long as the $u_t - v_t$'s are independent but not necessarily identically distributed (heteroskedastic, no serial correlation). The Newey-Wests are asymptotically robust if they are both dependent and have changing variance (heteroskedastic, serially correlated). Given the nature of the data the Newey-Wests are probably the best choice, and coincidentally they are also produce the smallest standard errors.

Table B.1 Response of market risk premium to changes in the bond rate

	$\hat{\beta}$	Standard error	p-value
Conventional	-0.25	0.48	0.61
White standard errors	-0.25	0.74	0.74
Newey-West standard errors (5 lags)	-0.25	0.43	0.56

Source: SACES calculations.

It should also be noted however that these standard errors are large and that the test does not have much power. This lack of power undermines the inferences that can be drawn from the data. To illustrate, the hypothesis that the required rate of return on equity is stable in the face of bond rate changes would imply $\beta = -1$ and the results in Table B.1 indicate that we could not reject that assumption with these data.