Attachment 7.13

NERA, MRP, analysis in response to the AER's draft rate of return guideline

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NERA
ECONOMIC CONSULTING

The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines

A report for the Energy Networks Association

October 2013

Project Team

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Executive Summary

This report has been prepared for the Energy Networks Association (ENA) by NERA Economic Consulting (NERA). The ENA has asked NERA to assess the methodology that the Australian Energy Regulator (AER) has laid out in its *Draft Rate of Return Guideline* to estimate a market risk premium (*MRP*) consistent with prevailing conditions.

In particular, the ENA has asked NERA to assess the extent to which the AER's proposal to rely on: [1]

- historical data on the returns to a portfolio of stocks in excess of the yield on a 10-year Commonwealth Government Security (CGS);
- DGM estimates;
- survey evidence;
- implied volatility; and
- recent determinations by Australian regulators

will enable the AER to construct an unbiased estimate of an *MRP* consistent with prevailing conditions.

The ENA has also asked NERA to assess whether there is evidence on which the AER does not intend to rely that would be relevant in determining an appropriate estimate of the *MRP* computed relative to the 10-year CGS yield.

Finally, the ENA has asked NERA to assess the argument that its advisors have advanced that one cannot provide a better estimate of an *MRP* consistent with prevailing conditions than an historical average of the returns to a portfolio of stocks in excess of the 10-year CGS yield.

Historical Data

On average through time the AER should set the *MRP* at its unconditional mean. Some of the time, if market conditions dictate, the AER should set the *MRP* above its unconditional mean and some of the time, if markets conditions dictate, the AER should set the *MRP* below its unconditional mean. On average through time, though – that is, not in every year but on average – the AER should set the *MRP* at its unconditional mean. It follows that a precise and unbiased estimate of the unconditional mean can be useful in judging whether an estimate of the conditional mean appears reasonable. [2,3] On average one would not expect an estimate of the conditional *MRP* to sit below an unbiased estimate of the *MRP*'s unconditional mean. If, for example, the AER were to conclude that an *MRP* consistent with

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[1] AER, *Explanatory statement: Draft rate of return guidelines*, August 2013, page 212.

[2] An estimator of a parameter is said to be unbiased if the expected value of the estimator matches the parameter. See, for example:

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

[3] The precision of a random variable is the reciprocal of its variance. See, for example,

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

prevailing conditions were to sit 100 basis points below an estimate of the *MRP*'s unconditional mean, then one would want to discover what information the regulator had used to reach such a conclusion and whether the information was reliable.

Dimson, Marsh and Staunton (2012) and Brailsford, Handley and Maheswaran (2012) provide two different estimates of the long-run mean return to a value-weighted portfolio of Australian stocks.[4] In their Credit Suisse Global Investment Returns Sourcebook 2013, Dimson, Marsh and Staunton report that the arithmetic mean of the annual return to a value-weighted portfolio of Australian stocks, exclusive of imputation credits, from 1900 to 2012, is 13.0 per cent. The arithmetic mean of the series of annual returns to a value-weighted portfolio of Australian stocks that Brailsford, Handley and Maheswaran supply and that we update, exclusive of imputation credits, from 1900 to 2012, is 12.0 per cent. Thus the arithmetic mean of the series of annual returns that Brailsford, Handley and Maheswaran supply is 100 basis points below the arithmetic mean of the series that Dimson, Marsh and Staunton use.

The difference between the two arithmetic means is primarily explained by differences in the way in which the dividends distributed by a value-weighted portfolio of stocks were determined by those who provided the data to the two sets of authors. Dimson, Marsh and Staunton (2013) use a series of dividend yields provided to them by Officer that is largely based on a series produced by Lamberton (1961).[5] Brailsford, Handley and Maheswaran (2012) use a series of yields provided to them by the Australian Stock Exchange that is also largely based on Lamberton's data.[6] The yields that Brailsford, Handley and Maheswaran use, however, have been adjusted downwards to take account of perceived deficiencies in the series that Lamberton provides.

We assess whether the adjustment to Lamberton's yield series in the data that Brailsford, Handley and Maheswaran employ is warranted and provide evidence that it is not. The evidence suggests that some adjustment should be made but that the adjustment should be *smaller* than the adjustment made in their data. An estimate of the downwards bias generated by inappropriately adjusting Lamberton's yield series is 18 basis points for the period that Dimson, Marsh and Staunton examine, 1900 to 2012, but 36 basis points for the longer period, 1883 to 2012, on which the AER in large part focuses.

Our estimates of the downward bias rely on Lamberton's series, Brailsford, Handley and Maheswaran's analysis of yield data for February 1966, our analysis of yield data for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941, December 1951 and interpolation.

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[4] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[5] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[6] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

An estimate of the *MRP* computed using the data that Brailsford, Handley and Maheswaran (2012) supply for the period 1883 to 2010 and that we update to 2012, assuming a value of 35 cents is assigned to each dollar of imputation credits distributed, adjusted for the bias that we identify, will be 6.50 per cent per annum.[7, 8]

DGM

The intuition behind the DGM is that market prices must reflect the dividends that investors expect to receive in future years but also the returns that the investors require. It follows that if one knows the price of a portfolio and one has a set of forecasts of the dividends that the portfolio will deliver, one can compute an estimate of the return that investors will require on the portfolio.

We note that Campbell and Thompson (2008) find evidence from US data that even simple valuation models can provide better out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate than an estimate of the return based on the sample mean of a series of historical excess returns.[9] The evidence that Campbell and Thompson (2008) provide is particularly important as Welch and Goyal (2008) argue that providing out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate that can outperform an estimate of the return based on the sample mean of a series of historical excess returns is difficult.[10]

Campbell and Thompson (2008) consider 11 different valuation models and find that in both monthly data and annual data the out-of-sample R^2 attached to the 'fixed-coefficient' forecasts that the valuation models make of the return to the market portfolio in excess of the risk-free rate are uniformly positive.[12, 13] In other words, forecasts that the valuation models deliver of the return to the market portfolio in excess of the risk-free rate are uniformly superior to the forecasts provided by the sample mean of a series of historical

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7 Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

8 This value is the value laid down by the ACT in a decision on the market value of a one-dollar credit distributed. See ACT, Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, May 2011.

9 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

10 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

12 The out-of-sample R^2 attached to a forecast is given by:

$$R^2_{OS} = 1 - \left[\sum_{t=1}^{T}(r(t)-\bar{r}(t))^2\right]^{-1} \sum_{t=1}^{T}(r(t)-\hat{r}(t))^2,$$

where $r(t)$ is the return to the market portfolio from time t-1 to t in excess of the risk-free rate, $\bar{r}(t)$ is the sample mean of a series of historical excess returns and $\hat{r}(t)$ is the forecast.

13 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

excess returns. The fixed-coefficient forecasts are forecasts that use the models directly and so do not require that one estimate regression parameters. [14]

An alternative to the single-stage valuation models that Campbell and Thompson (2008) use is a model in which short-term forecasts of real dividend growth are combined with a long-term assumption about real dividend growth and an assumption about the time that it takes for the short-term to evolve into the long-term. [15] Li, Ng and Swaminathan (2013) examine whether a multi-stage model can forecast the excess return to the market portfolio and find evidence that is statistically significant that it can at horizons of up to four years. [16]

While there is evidence that the DGM can track variation in the *MRP* through time, simple models typically require as an input an estimate of the long-run real growth in dividends. There is, however, uncertainty about what constitutes a reasonable value for long-run real dividend growth. While this uncertainty may not pose a significant problem for an investor who wishes to use the DGM for his or her own purposes, it may pose a problem for the regulatory process. An institution that seeks to produce an estimate of the *MRP* that is high may find a relatively high estimate of long-run growth attractive because a high estimate will generate a correspondingly high estimate of the *MRP*. Similarly, an institution that seeks an estimate of the *MRP* that is low may find a relatively low estimate of long-run growth attractive because a low estimate will generate a correspondingly low estimate of the *MRP*.

SFG (2013) provide a method, based on the work of Fitzgerald, Gray, Hall and Jeyaraj (2013) that provides a purely mechanical way of determining what the market considers to be long-run growth. [17] They use analyst forecasts to back out what the market believes for each firm to be the cost of equity, long-run growth and the accounting return to equity. Their method is attractive because long-run growth is estimated from currently available market data and so the ability to manipulate estimates of long-run growth is largely eliminated. We believe that the AER should use a DGM to estimate the *MRP* and that it should use a method, like the method that SFG outlines, that will remove any incentives that might otherwise exist to manipulate estimates of long-run growth.

Surveys

We emphasise that there are a number of problems with surveys that ask individuals about their views on the *MRP* and that these include that:

- surveys often do not explain how those surveyed were chosen;
- a majority of those surveyed typically do not respond;

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[14] In other words, the fixed-coefficients forecasts use the predictions of a valuation model and not linear functions that one must estimate of the predictions.

[15] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[16] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

[17] Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

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

- it is unclear what incentives are provided to individuals contacted by surveys to ensure that respondents will provide accurate responses;
- it is generally unclear whether respondents believe that they should supply estimates of the *MRP* that they base on arithmetic means or geometric means;
- it is often unclear what value respondents place on imputation credits;
- it often unclear what risk-free rate respondents use; and importantly
- it is unclear how relevant some surveys are because of changes in market conditions since the time at which the surveys were conducted.

We note that an estimate of the *MRP* based on the geometric mean of a series of returns to the market portfolio can sit 200 basis points below an estimate that is based on the arithmetic mean.[18] We show in our June 2013 report that an estimate of the *WACC* that is based, in part, on the arithmetic mean of a sample of annual returns to the market portfolio will produce an unbiased estimate of the true *WACC* and so will lead the present value principle to be on average satisfied. In contrast, an estimate of the *WACC* that is in part based on an estimate of the *MRP* that places a positive weight on the geometric mean of a sample of annual returns to the market portfolio will produce a downwardly biased estimate of the true *WACC* and will lead the present value principle to be on average violated. If survey respondents supply estimates of the *MRP* that are based on the geometric mean of a sample of annual returns to the market portfolio, then the use of the survey responses will lead the present value principle to be on average violated. Dimson, Marsh and Staunton (2013) place as much emphasis on geometric means as on arithmetic means and so it is quite possible that some survey respondents will supply what they know to be geometric means computed from past data.[19]

Implied volatility

There is strong evidence that implied volatility can track variation in market volatility and some weak evidence in US data that implied volatility can track variation through time in the *MRP*. While this may be true, however, it is unclear whether implied volatility provides information not already contained in DGM estimates of the *MRP*.

Regulator Decisions

While it makes sense for the AER to be cognisant of decisions that other regulators make both in Australia and abroad and to understand the rationales behind the decisions, the AER should not base decisions about the *MRP* on decisions made by other regulators. It is difficult to understand why, for example, it would make sense for the AER to set the *MRP* at a level that is below an *MRP* consistent with prevailing conditions simply because another

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[18] See, for example,

Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

[19] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

regulator had done so. The AER should base its decisions solely on an analysis of market data. These data should include historical data, current market data and analyst forecasts.

Other Evidence

Campbell and Thompson (2008) provide evidence that once sensible constraints are placed on the signs of coefficients and on return forecasts, many predictive regressions provide forecasts of the return to the market portfolio in excess of the risk-free rate that beat, on an out-of-sample basis, estimates that are based on the sample mean of a series of historical excess returns.[20] Li, Ng and Swaminathan (2013) provide in-sample evidence, however, that forecasts of the return to the market portfolio in excess of the risk-free rate provided by a multi-stage valuation model provide information that is not supplied by variables that include the dividend yield, default spread bill rate and term spread.[21] Their evidence suggests that one can do no better than use the forecast provided by a valuation model – at least so long as the valuation model is properly specified. We believe that the model that SFG (2013) provide, that is based on the work of Fitzgerald, Gray, Hall and Jeyaraj (2013), is such a model.[22]

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[20] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[21] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

[22] Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

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

1. Introduction

This report has been prepared for the Energy Networks Association (ENA) by NERA Economic Consulting (NERA). The ENA has asked NERA to assess the methodology that the Australian Energy Regulator (AER) has laid out in its *Draft Rate of Return Guideline* to estimate a market risk premium (*MRP*) consistent with prevailing conditions.

In particular, the ENA has asked NERA to assess the extent to which the AER's proposal to rely on:

- historical data on the returns to a portfolio of stocks in excess of the yield on a 10-year Commonwealth Government Security (CGS);
- DGM estimates;
- survey evidence;
- implied volatility; and
- recent determinations by Australian regulators

will enable the AER to construct an unbiased estimate of an *MRP* consistent with prevailing conditions.

The ENA has also asked to NERA to assess whether there is evidence on which the AER does not intend to rely that would be relevant in determining an appropriate estimate of the *MRP* computed relative to the 10-year CGS yield.

Finally, the ENA has asked NERA to assess the argument that its advisors have advanced that one cannot provide a better estimate of an *MRP* consistent with prevailing conditions than an historical average of the returns to a portfolio of stocks in excess of the 10-year CGS yield.

The remainder of this report is structured as follows:

- section 2 updates the historical data on which the AER has in the past relied and provides further details about our analysis of the dividend series that forms part of the data;
- section 3 assesses the method that the AER has laid out in its *Draft Rate of Return Guideline* to estimate an *MRP* consistent with prevailing conditions and assesses arguments that the AER's advisors have advanced about whether one can track variation in the *MRP* through time; and
- section 4 provides conclusions.

In addition:

- Appendix A describes the contents of the disk containing data and programs that was provided to the AER some months ago;
- Appendix B provides the annual data that we construct from 1883 to 2012;
- Appendix C provides the terms of reference for this report;

- Appendix D provides a copy of the Federal Court of Australia's *Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia*; and
- Appendix E provides the curricula vitae of the two authors of the report.

1.1. Statement of Credentials

This report has been jointly prepared by **Simon Wheatley** and **Brendan Quach**.

Simon Wheatley is a Special Consultant with NERA, and was until 2008 a Professor of Finance at the University of Melbourne. Since 2008, Simon has applied his finance expertise in investment management and consulting outside the university sector. Simon's interests and expertise are in individual portfolio choice theory, testing asset-pricing models and determining the extent to which returns are predictable. Prior to joining the University of Melbourne, Simon taught finance at the Universities of British Columbia, Chicago, New South Wales, Rochester and Washington.

Brendan Quach is a Senior Consultant at NERA with eleven years experience as an economist, specialising in network economics and competition policy in Australia, New Zealand and the Asia Pacific. Since joining NERA in 2001, Brendan has advised a wide range of clients on regulatory finance matters, including approaches to estimating the cost of capital for regulated infrastructure businesses.

In preparing this report, the joint authors (herein after referred to as 'we' or 'our' or 'us') confirm that we have made all the inquiries that we believe are desirable and appropriate and that no matters of significance that we regard as relevant have, to our knowledge, been withheld from this report. We acknowledge that we have read, understood and complied with the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia*. We have been provided with a copy of the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia*, dated 4 June 2013, and our report has been prepared in accordance with those guidelines.

We have undertaken consultancy assignments for the Energy Networks Association in the past. However, we remain at arm's length, and as independent consultants.

2. Historical Data

Dimson, Marsh and Staunton (2013) and Brailsford, Handley and Maheswaran (2012) provide two different estimates of the long-run Australian *MRP* based on two different but closely related series of returns to a value-weighted portfolio of Australian stocks.[23] In their *Credit Suisse Global Investment Returns Sourcebook 2013*, Dimson, Marsh and Staunton report that the arithmetic mean of the annual return to a value-weighted portfolio of Australian stocks, exclusive of imputation credits, from 1900 to 2012, is 13.0 per cent. The arithmetic mean of the series of annual returns to a value-weighted portfolio of Australian stocks that Brailsford, Handley and Maheswaran supply and that we update, exclusive of imputation credits, from 1900 to 2012, is 12.0 per cent. Thus the arithmetic mean of the series of annual returns that Brailsford, Handley and Maheswaran supply is a full percentage point below the arithmetic mean of the series that Dimson, Marsh and Staunton use.

The difference between the two arithmetic means is primarily explained by differences in the way in which the dividends distributed by a value-weighted portfolio of Australian stocks were determined by those who provided the data to the two sets of authors. Dimson, Marsh and Staunton (2013) use a series of dividend yields provided to them by Officer that is largely based on a series produced by Lamberton (1961).[24] Brailsford, Handley and Maheswaran (2012) use a series of yields provided to them by the Australian Stock Exchange that is also largely based on Lamberton's data.[25] The yields that Brailsford, Handley and Maheswaran use, however, have been adjusted downwards to take account of perceived deficiencies in the series that Lamberton provides.

In our June 2013 submission to the AER on behalf of the ENA, *Market, Size and Value Premiums*, we assess whether the adjustment to Lamberton's yield series in the data that Brailsford, Handley and Maheswaran (2012) employ is warranted and provide evidence that it is not entirely warranted.[26] The evidence suggests that some adjustment should be made but that the adjustment should be smaller than the adjustment made to the data with which Brailsford, Handley and Maheswaran were provided. An estimate of the downwards bias generated by the inappropriate adjustment of Lamberton's yield series is only 18 basis points for the period that Dimson, Marsh and Staunton examine, 1900 to 2012, but is 36 basis points for the longer period, 1883 to 2012, on which the Australian Energy Regulator (AER) in large part relies.

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[23] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[24] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[25] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[26] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013.

Our estimates of the downward bias rely on Lamberton's series, Brailsford, Handley and Maheswaran's analysis of yield data for February 1966, our analysis of yield data for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941, December 1951 and interpolation.

The AER has not provided any formal feedback on our June 2013 submission. Informal feedback, though, has been that the AER, despite our best efforts in our June 2013 submission to be as clear as possible and the provision to the AER of a disk containing very detailed information on the data that we collect, is unclear about how we assemble yield data from the sources that we describe. Consequently, in this section we explain in greater detail how we assemble the data. There is, of course, by necessity a substantial overlap between the material that we provide in this report and the material that we provide in our June 2013 submission.

We begin by describing how Dimson, Marsh and Staunton (2013), Brailsford, Handley and Maheswaran (2012) and Lamberton (1958, 1961) assemble their data. [27]

2.1. Dimson, Marsh and Staunton Data

Dimson, Marsh and Staunton (2013) use data that Officer (1989) provides together with data for the Standard and Poors (S&P) All Ordinaries Accumulation Index to construct a series of with-dividend returns to a value-weighted portfolio of Australian stocks. [28] Officer's data consist of:

- the Commercial and Industrial price index assembled by Lamberton (1958) from 1882 to 1958; [29]
- the series of yields on ordinary shares provided by Lamberton (1961) from 1882 to 1958; [30]
- an accumulation index of 50 leading shares constructed by the Australian Graduate School of Management (AGSM) from 1958 to 1974; and

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[27] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.

Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July and 14 August 1958.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[28] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Officer, R., *Rates of return to shares, bond yields and inflation rates: An historical perspective*, in Ball, R., P. Brown, F. Finn and R. Officer (Eds), *Share markets and portfolio theory*, Second edition, University of Queensland Press, 1989.

[29] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.

[30] Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

- the AGSM Value-Weighted Accumulation Index from 1975 to 1987. [31]

Dimson, Marsh and Staunton use these data from 1900 to 1979 but from 1980 onwards, they use:

- the S&P All Ordinaries Accumulation Index.

Dimson, Marsh and Staunton are aware of the data that Brailsford, Handley and Maheswaran (2008, 2012) assemble but state that because: [32]

> 'Brailsford, Handley and Maheswaran (2008) ... do not present alternative annual dividend estimates ... we continue to use Officer's dataset.'

2.2. Brailsford, Handley and Maheswaran Data

Brailsford, Handley and Maheswaran (2008, 2012) use data provided to them by the Australian Stock Exchange. [33] Surprisingly, when we asked the Australian Stock Exchange for the data and a description of how the data were constructed, we were told no reference to the data provided to Brailsford, Handley and Maheswaran could be found. [34] Brailsford, Handley and Maheswaran, however, state that their data are constructed from: [35]

- the Commercial and Industrial index assembled by Lamberton (1958) from 1882 to 1936; [36]

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[31] Officer constructs with-dividend returns from 1882 to 1958 using the price index and yield series that Lamberton provides and constructs with-dividend returns from 1958 to 1987 using the accumulation indices provided by the AGSM. Note that the percentage change in an accumulation index from one year to the next is the annual with-dividend return to the index.

[32] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013, page 61.

[33] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[34] To be precise, we sent an email to the ASX on 17 August 2011 stating that:

> '(we) would like to know from where the data Brailsford, Handley and Maheswaran are using came. They say the ASX but you tell (us) you know nothing about the data'

and were told by the ASX in an email dated 25 August 2011 that:

> 'the employee of the ASX who specialises in the field of Index Data is Brian Goodman ... he could not find any reference to the indices mentioned in your email dated August 15.'

This correspondence does not imply that Brailsford, Handley and Maheswaran did not correspond with the ASX. It implies only that the ASX either do not possess or cannot find the data provided to Brailsford, Handley and Maheswaran.

[35] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 78-79.

[36] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

- the Sydney Stock Exchange (SSE) All Ordinary Shares price index from 1936 to 1979;
- the S&P All Ordinaries Accumulation Index from 1980 onwards;

and in a way that is not completely specified:

- the Lamberton/SSE yield series from 1882 to 1979; [37]
- the Melbourne 50 Leaders weighted yield series from 1965 to 1979; and
- the Statex yield series from 1974 to 1979.

Although, the exact way in which all three yield series are used is not specified, Brailsford, Handley and Maheswaran (2008) indicate that an analysis of the data suggests that the yields provided by Lamberton and the SSE were lowered between 1882 and 1964 by multiplying them by 0.75. [38] Brailsford, Handley and Maheswaran suggest that Lamberton's series was adjusted downwards to take account of two perceived deficiencies in the series:

- Lamberton's series is an equally weighted rather than a value-weighted average of the yields on stocks and so places more weight on smaller, potentially higher yielding stocks; and
- the series is an average of only the yields on dividend-paying stocks and so places no weight on stocks that pay no dividends.

Brailsford, Handley and Maheswaran (2008) estimate the yield on a value-weighted index of 908 stocks for February 1966 and find it to be just 67 per cent of the yield on an equally weighted index of the 590 of the 908 stocks paying dividends. [39] So they conclude that the adjustment made to the data with which they were supplied appears appropriate. Our analysis of the annual series that Brailsford, Handley and Maheswaran provide and Lamberton's series confirms that Lamberton's series was indeed multiplied by a factor of 0.75 between 1883 and 1957. Using an adjustment factor of 0.75, we are able to independently construct a series of annual with-dividend returns in per cent from 1883 to 1957 to a portfolio of Australian stocks that matches to one decimal place the series that Brailsford, Handley and Maheswaran provide in every year except one. [40]

We construct the series of annual with-dividend returns using the series of dividend yields that Lamberton (1961) provides and a series of price indices provided to us by Wren Advisers, who in turn were provided the data by the Australian Stock Exchange. [41] We believe this

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[37] Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[38] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, page 80.

[39] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, page 80.

[40] The with-dividend return that Brailsford, Handley and Maheswaran report for 1921 is 19.9 per cent. We compute the return to be 19.8 per cent.

[41] Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

series of price indices to be the series that Brailsford, Handley and Maheswaran employ from 1882 to 1979 and that the series consists of:

- the Commercial and Industrial index assembled by Lamberton (1958) from 1882 to 1936; [42] and
- the Sydney Stock Exchange (SSE) All Ordinary Shares price index from 1936 to 1979

with or without some rounding and the elimination or introduction of some minor errors.

Using the price series provided by Wren Advisers, we can construct a series of annual without-dividend returns in per cent from 1883 to 1957 to a portfolio of Australian stocks that matches to one decimal place the series that Brailsford, Handley and Maheswaran (2012) provide in every year. [43] In contrast, using the original series that Lamberton supplies taken from the original documents that Lamberton provides we are unable to match the series that Brailsford, Handley and Maheswaran provide quite as closely. In particular, we uncover the relatively large discrepancies shown in Table 2.1 below.

Table 2.1
Discrepancies between Lamberton's series and the series that Wren Advisers and Brailsford, Handley and Maheswaran (2012) supply

	Without-dividend return provided by		
Year	Lamberton	Wren Advisers	Brailsford, Handley & Maheswaran
1918	4.0	1.9	1.9
1919	10.3	12.6	12.6
1924	8.9	7.6	7.6
1925	10.1	11.4	11.4

Notes: Data are from:

Brailsford, T., J. Handley and K. Maheswaran, The historical equity risk premium in Australia: Post-GFC and 128 years of data, Accounting and Finance, 2012, pages 237-247.

Lamberton, D., Security prices and yields, Sydney Stock Exchange Official Gazette, 14 July 1958.

http://www.wrenadvisers.com.au/downloads/files/mxaoi.csv

We do not know whether the discrepancies are due to errors in the data that Lamberton reports or errors in the data that Wren Advisers and Brailsford, Handley and Maheswaran use. To ensure that there are no differences between the without-dividend returns that we compute

http://www.wrenadvisers.com.au/downloads/files/mxaoi.csv

[42] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

[43] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

and those that Brailsford, Handley and Maheswaran provide, in updating their data, we use the series of price indices that Wren Advisers provide. [44]

2.3. Lamberton Data

Lamberton describes the construction of his database in five reports:

> Lamberton, D., *Some statistics of security prices and yields in the Sydney market, 1875-1955*, Economic Record, pages 253-259.
>
> Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.
>
> Lamberton, D., *Economic growth and stock prices: The Australian experience*, Journal of Business, 1958, pages 200-212.
>
> Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958, pages 257-258 and 14 August 1958, page 307.
>
> Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

Lamberton provides in the *Sydney Stock Exchange Official Gazette* monthly price series for three indices, an index of commercial and industrial stocks, an index of financial stocks and an index of mining stocks together with a list of the firms that he uses. The commercial and industrial series and financial series run from January 1875 to June 1936 while the mining series runs from January 1875 to December 1910. Lamberton also provides a list of the stocks that he uses and the periods over which he uses them.

Lamberton provides in his book a number of monthly price series from July 1936 to December 1957 including a series for an index he labels All Ordinary Shares together with a list of the firms and issues that he uses. The series that Officer (1989) and Brailsford, Handley and Maheswaran (2008, 2012) construct use the index of commercial and industrial stocks from 1882 to 1936 and the All Ordinary Shares index from 1936 to 1957. [45]

Lamberton also provides in the *Sydney Stock Exchange Official Gazette* of 1958 a quarterly yield series that runs from the last quarter of 1882 to the last quarter of 1955. He subsequently provides in the *Sydney Stock Exchange Official Gazette* of 1961 a monthly yield series that runs from January 1956 to June 1961. The yield series that he produces uses all of the firms that he employs to construct price indices. In other words, Lamberton does not produce a yield series for each index that he constructs. Also, the yield series that he produces is not value-weighted. Our focus here is on this series and the extent to which it

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[44] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[45] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Officer, R., *Rates of return to shares, bond yields and inflation rates: An historical perspective*, in Ball, R., P. Brown, F. Finn and R. Officer (Eds), *Share markets and portfolio theory*, Second edition, University of Queensland Press, 1989.

overstates the yield on a value-weighted index of stocks. In particular, our interest is in whether the adjustment made to the series that Brailsford, Handley and Maheswaran (2008, 2012) employ, which involves multiplying Lamberton's series by 0.75, is appropriate over the entire length of the series. [46]

We focus on the period 1883 to 1957 because this is the period over which a high-quality alternative set of data – the AGSM data – are not available.

2.4. Adjustments

Brailsford, Handley and Maheswaran (2008) estimate the yield on a value-weighted index of 908 stocks for February 1966 and find it to be just 67 per cent of the yield on an equally weighted index of the 590 of the 908 stocks paying dividends. [47] So they conclude that the adjustment made to the data with which they were supplied appears appropriate. While neither Officer nor Dimson, Marsh and Staunton use the yield on an equally weighted index of stocks after 1958, and, therefore, do not do so in 1966, the observation that Brailsford, Handley and Maheswaran make nonetheless suggests that an adjustment to Lamberton's series is warranted. It is unclear, however, whether the same adjustment should be made to all yields from 1883 to 1958. To investigate whether the adjustment to be made should vary through time, we collect yield data for the years 1891, 1901, 1911, 1921, 1931, 1941 and 1951 for the stocks that Lamberton uses to construct a yield series.

Lamberton (1958) states that in constructing price series: [48]

> 'data were taken from the following sources: *Sydney Morning Herald* financial pages, January 1875-September 1882; T. J. Thompson and Sons' monthly *Stock and Share Reports*, October 1882-December 1903; Sydney Stock Exchange official sales records, January 1904-June 1936. Details of the capitalization of companies were obtained from the *Sydney Morning Herald* financial pages, the *Australasian Insurance and Banking Record*, the *Australasian Joint Stock Companies' Year Books*, the monthly *Stock and Share Reports* of T. J. Thompson and Sons, *Jobson's Investment Digest*, and the *Investment Service* of the Research & Statistical Bureau of the Sydney Stock Exchange.'

On the other hand, Lamberton (1961) states about the yield series that he constructs that: [49]

> 'the data, which relate to the end of the month except from 1914 to 1934 when mid-month values were used, were taken from the *Stock and Share Reports* of T. J.

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[46] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[47] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

[48] Lamberton, D., *Some statistics of security prices and yields in the Sydney market, 1875-1955*, Economic Record, page 254.

[49] Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961, page 341.

> Thompson and Sons for the period 1882-1913, and from the *Sydney Stock Exchange Official Gazette* beginning with 1914.'

We use some of the same sources that Lamberton employs. In particular, we use:

- data from the *Australasian Insurance and Banking Record* for 1891, 1901, 1911, 1921, 1931 and 1941;
- data from T. J. Thompson and Sons' monthly *Stock and Share Reports* for 1891, 1901 and 1911;
- data from the *Sydney Stock Exchange Official Gazette* for 1941 and 1951; and
- data from the *Sydney Morning Herald* for 1891, 1901, 1911, 1921, 1931, 1941 and 1951.

We also use:

- data from the *Australian Town and Country Journal* for 1891, data from the *Brisbane Courier* for 1901, data from the *Mercury* for 1921 and data from the *Argus* for 1941 to fill in some gaps.

We follow Lamberton and use end-of-month values for all years except 1921 and 1931, where we use mid-month values.

2.4.1. Details

To illustrate the process that we go through in computing a value-weighted dividend yield for each year that we examine, we consider one year, 1891, in some detail. The process that we go through is also described in the worksheet entitled 'Notes' of the workbook entitled 'Dividend Data' that is in the folder 'Analysis\XLS' of the disk that was provided to the AER in early July 2013. An updated version of the disk will be provided to the AER and the contents of the disk are described in Appendix A.

We first identify from the lists that Lamberton (1958) provides which firms in 1891 belong to the commercial and industrial index, which firms belong to the financial index and which firms belong to the mining index.[50] These firms appear in the worksheet '1891' of the workbook 'Dividend Data' that is in the folder 'Analysis\XLS' of the disk provided to the AER and also in Table 2.2 below.

We next draw paid-up capital, paid per share, dividend data, where available, and the bid and ask price of each stock from the *Australasian Insurance and Banking Record*. We enter these data in to the spreadsheet '1891' in black. We also enter in black the state in which the exchange is located on which the stock trades and the date on which the bid and ask prices are recorded. We then check this information against information provided by T. J. Thompson & Sons' *Stock & Share Report*. Where the data differ, we use the data from T. J. Thompson & Sons unless a third source suggests that we should do otherwise. Data that are from T. J. Thompson we enter in blue. We find, for example, that the *Australasian Insurance*

[50] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 August 1958, page 307.

and Banking Record reports that Colonial Sugar has two classes of shares – one fully paid up and the other only partially paid – while T. J. Thompson & Sons indicate that all shares are fully paid up. A third source, Joseph Palmer and Sons' *Monthly Share List* published in the *Australian Town and Country Journal* corroborates the data that appear in the *Australasian Insurance and Banking Record* and so we use these data. Data from the *Australian Town and Country Journal* we enter in mauve.

Where neither the *Australasian Insurance and Banking Record* nor T. J. Thompson & Sons' *Stock & Share Report* contain the data that we require, we search for other sources using the National Library of Australia's database Trove. We find the ask price of a partially paid share in Colonial Sugar, for example, from Joseph Palmer and Sons' *Monthly Share List* published in the *Australian Town and Country Journal*. So we enter this price in to the spreadsheet '1891' in mauve.

Since Lamberton uses end-of-month prices in 1891, we follow suit and so wherever possible replace the bid and ask prices that we extract from the *Australasian Insurance and Banking Record* or other sources with bid and ask prices taken from the Sydney Morning Herald as close as possible to the end of the year. We enter these data in green. To help the reader see quickly from where the price data are sourced, we also ensure that the date entered is the date on which the prices were recorded and that the colour of the date matches the colour of the price data. If it is necessary to compute the number of shares outstanding, we do so by dividing paid-up capital by paid per share. So for example, the paid-up capital for Tooth was at the end of 1891 £900,000 and the amount paid per share was £1. So Tooth had 900,000 shares outstanding at the end of 1891.

In general, we compute the dividend yield on the ordinary shares that a commercial, industrial or financial company has outstanding as:

$$\frac{RATE(t) \times PAID(t)}{PRICE(t)} \tag{1}$$

where

$RATE(t)$	=	annual rate at which dividends were last paid in month t;
$PAID(t)$	=	paid-up capital per share in month t; and
$PRICE(t)$	=	average of bid and ask price per share in month t if both are available, the bid or ask if only one is available and the last sale if neither are available.

As an example, as of the end of 1891, bid and ask prices for the one issue of Tooth ordinary shares were 14/9 and 15/3, paid-up capital per share was £1, and dividends had been distributed at the last payment date at a rate of 8 per cent per annum.[51] So we compute the yield on a share of Tooth as of the end of 1891 as:

[51] Recall that the notation X/Y means X shillings and Y pence. Recall also that prior to 1963 there were 12 pence to a shilling and 20 shillings to a pound.

$$\frac{8 \times 1}{((14 + 9/12)/20 + (15 + 3/12)/20)/2} = 10.67 \text{ per cent} \quad (2)$$

The data in the column entitled 'Last Dividend' entered for commercial, industrial or financial companies in the worksheet '1891' of the workbook 'Dividend Data' are dividends paid in per cent per £1 of paid-up capital – that is, the data are dividend rates. In contrast, we typically compute the dividend yield on the ordinary shares that a mining company has outstanding as:

$$\frac{DIVIDENDS(t)}{PRICE(t)} \quad (3)$$

where

$DIVIDENDS(t)$ = the dividends paid out per share over the 12 months up to and including month t.

We do so because the sources that we use do not indicate the annual rate at which mining companies pay dividends and because mining companies, at least in the earlier part of our data set, often do not pay dividends at regular intervals. As an example, as of the end of 1891, bid and ask prices for Broken Hill Proprietary (BHP) ordinary shares were £7 3s. and £7 4s. and an inspection of the *Australasian Insurance and Banking Record* month by month over 1891 reveals that dividends of £1 4s. had been distributed over 1891.[52] So we compute the yield on a share of BHP as of the end of December 1891 as:

$$\frac{100 \times (1 + 4/20)}{(7 + 3/20 + 7 + 4/20)/2} = 16.72 \text{ per cent} \quad (4)$$

The data in the column entitled 'Last Dividend' entered for mining companies in the worksheet '1891' of the workbook 'Dividend Data' are dividends paid per share over the previous year – that is, the data are not dividend rates. We enter the data differently because the original sources typically quote dividend rates for commercial, industrial and financial companies and dividends per share for mining companies.

Table 2.2 provides a selection of the variables that appear in the worksheet '1891' and shows that while it may sometimes be necessary to access data from more than one source, we are able to track down information on all of the firms that Lamberton includes in his indices. Table 2.3 provide dividend yields and market capitalisations for each issue. We compute the market capitalisation as the product of the number of shares outstanding and the price of the stock, where the price is the average of the bid and ask prices if both are available, the bid or ask if only one is available and the last sale if neither are available.

[52] £X Ys. Means X pounds and Y shillings.

Table 2.2
Data for the stocks that belong to Lamberton's indices in 1891

State	Day	Month	Paid	Paid per share	Number	Company Name	Last Dividend	Buy	Sell
					Commercial and industrial				
NSW	24	12	621,798	6.00	103,633	Australian Gaslight	15.00	11.75	12.13
NSW	24	12	40,000	4.00	10,000	Australian Gaslight	15.00	8.53	
NSW	24	12	250,000	1.00	250,000	Castlemaine & Wood Brewery	10.00	0.99	1.04
NSW	24	12	1,326,320	20.00	66,316	Colonial Sugar	10.00	24.00	24.50
NSW	9	12	86,840	10.00	8,684	Colonial Sugar	10.00		14.00
NSW	24	12	66,250	0.66	100,000	New South Wales Shale and Oil	11.32	0.26	0.30
NSW	24	12	100,000	10.00	10,000	Newcastle Wallsend Coal	45.00	28.00	35.00
NSW	24	12	40,000	1.00	40,000	North Shore Sydney Ferries	10.00		1.75
NSW	24	12	900,000	1.00	900,000	Tooth	8.00	0.74	0.76
					Financial				
NSW	24	12	675,000	9.00	75,000	Australian Joint Stock Bank	15.00	19.88	20.00
NSW	24	12	1,250,000	20.00	62,500	Bank of New South Wales	17.50	60.00	
NSW	24	12	240,000	8.00	30,000	City Bank of Sydney	10.00	8.75	9.13
NSW	24	12	40,000	2.00	20,000	City Bank of Sydney	10.00		2.50
NSW	24	12	600,000	25.00	24,000	Commercial Bank of Sydney	25.00	112.50	115.50
NSW	24	12	15,000	0.10	150,000	Mercantile Mutual	25.00	0.28	
NSW	24	12	50,001	1.00	50,001	NSW Mont de Piete	10.00		1.25
NSW	24	12	25,000	0.13	200,000	Permanent Trustee	0.00	0.13	0.15
NSW	24	12	25,000	0.25	100,000	Perpetual Trustee	0.00	0.65	0.78
					Mining				
VIC	12	12		20.10	22,450	Band and Albion	0.00		0.28
VIC	24	12		9.65	100,000	Broken Hill Block 10	242.50	11.85	11.95
VIC	24	12		5.00	100,000	Broken Hill Block 14	72.50	5.75	
VIC	24	12		0.40	960,000	Broken Hill Pty	120.00	7.15	7.20
VIC	24	12		1.00	100,000	Broken Hill South	0.00	2.78	2.85
VIC	12	12		0.13	100,000	Broken Hill South	0.00	2.20	2.25
SMH	24	12	80,000	1.00	80,000	Great Cobar	0.00	0.13	
QLD	24	12	875,000	0.88	1,000,000	Mount Morgan	36.67	2.00	2.25
VIC	24	12		0.75	120,000	North Broken Hill	0.00		0.28
SMH	24	12	80,000	1.00	80,000	Nymagee	0.00		0.13

Notes: The data are from the Australasian Insurance and Banking Record, T. J. Thompson & Sons' Stock & Share Report, Joseph Palmer and Sons' Monthly Share List published in the Australian Town and Country Journal and the Sydney Morning Herald. Paid, paid per share and buy and sell prices are in pounds. For commercial, industrial or financial companies, the last dividend is dividends paid in per cent per £1 of paid-up capital. For mining companies, the last dividend is the dividends paid per share of the last year.

Table 2.3
Data for the stocks that belong to Lamberton's indices in 1891

Company Name	Yield	Market Capitalisation
Commercial and industrial		
Australian Gaslight	7.54	1,237,119
Australian Gaslight	7.04	85,250
Castlemaine & Wood Brewery	9.88	253,125
Colonial Sugar	8.25	1,608,163
Colonial Sugar	7.14	121,576
New South Wales Shale and Oil	26.67	28,125
Newcastle Wallsend Coal	14.29	315,000
North Shore Sydney Ferries	5.71	70,000
Tooth	10.67	675,000
Financial		
Australian Joint Stock Bank	6.77	1,495,313
Bank of New South Wales	5.83	3,750,000
City Bank of Sydney	8.95	268,125
City Bank of Sydney	8.00	50,000
Commercial Banking Co. Of Sydney	5.48	2,736,000
Mercantile Mutual	9.09	41,250
New South Wales Mont de Piete	8.00	62,501
Permanent Trustee	0.00	27,500
Perpetual Trustee	0.00	71,250
Mining		
Band and Albion	0.00	6,174
Broken Hill Block 10	20.38	1,190,000
Broken Hill Block 14	12.61	575,000
Broken Hill Pty	16.72	6,888,000
Broken Hill South	0.00	281,250
Broken Hill South	0.00	222,500
Great Cobar	0.00	10,000
Mount Morgan	17.25	2,125,000
North Broken Hill	0.00	33,000
Nymagee	0.00	10,000

Notes: The data are from the Australasian Insurance and Banking Record, T. J. Thompson & Sons' Stock & Share Report, Joseph Palmer and Sons' Monthly Share List published in the Australian Town and Country Journal and the Sydney Morning Herald. Market capitalisations are in pounds.

2.4.2. Yields

To compute the dividend yield of a value-weighted portfolio, we weight each stock's dividend yield by the market capitalisation of the stock. Table 2.4 provides various dividend yield estimates for the seven years that we select between 1883 and 1957 computed using all of the firms that Lamberton employs in constructing his yield series. The table shows that the number of firms and issues that Lamberton uses grows substantially through time. While Lamberton uses only 24 firms in 1891, he uses 166 firms in 1951. This largely reflects a growth in the number of firms listed on Australian exchanges. It may also, though, reflect an increase over time in the availability of data. The table also shows that firms may have more than one issue of ordinary shares outstanding. Where a firm has more than one issue of ordinary shares outstanding, we use all of the issues for which we can find data. The number of issues with missing data is small. There are 12 issues with missing data – they are predominantly mining companies in 1901 – while there are 532 issues without missing data. So less than 2½ per cent of the issues that Lamberton uses in constructing a series of yields are missing data.

Since Lamberton uses a variety of sources and we do not know precisely which sources he uses to compute the yield to each issue on each date, it is not surprising that our yield estimates differ from his. Our estimates, though, are strongly correlated with his estimates over time. The correlation between our estimate of the equally weighted average yield to dividend paying issues (firms) and his estimate is 0.93 (0.94) across the seven years we examine. Also, the means of our series come close to matching the mean of his estimates. The mean of our seven estimates of the equally weighted average yield to dividend paying issues (firms) is 7.19 (7.16) while the mean of his seven estimates is 7.09.

Table 2.4 shows that it is not always the case that an equally weighted average of the yields on stocks lies above a value-weighted average. In 1901, 1911, 1921, 1941 and 1951, an equally weighted average across issues or firms does lie above a value-weighted average but in 1891 and 1931, the reverse is true. Also, in only one of the seven years does the ratio of a value-weighted average to Lamberton's yield fall below the adjustment factor that Brailsford, Handley and Maheswaran (2008, 2012) use of 0.75.[53] The average ratio over the seven years is 0.85.

The results in Table 2.4 are for a portfolio formed from the stocks that Lamberton uses to construct a yield series. This portfolio includes financial and mining companies. Neither Officer (1989) nor Brailsford, Handley and Maheswaran (2008, 2012), however, use financial or mining stocks over the period 1882 to 1936.[54] They use instead a portfolio that contains

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[53] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[54] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Officer, R., *Rates of return to shares, bond yields and inflation rates: An historical perspective*, in Ball, R., P. Brown, F. Finn and R. Officer (Eds), *Share markets and portfolio theory*, Second edition, University of Queensland Press, 1989.

only commercial and industrial companies. For this reason, we also examine what the data indicate the adjustment factor should be for the data that Officer, Brailsford, Handley and Maheswaran use. Table 2.5 provides the results of this exercise.

Table 2.4
Dividend yield estimates for 1891 to 1951 computed using firms that Lamberton (1958) employs in constructing his yield series

	1891	1901	1911	1921	1931	1941	1951
Panel A: Equally weighted averages							
Issues	28	36	33	47	59	128	201
Average across issues	7.72	6.42	5.58	7.47	3.97	5.98	4.56
Issues paying dividends	20	28	32	45	41	116	169
Average across dividend paying issues	10.81	8.25	5.76	7.80	5.71	6.60	5.42
Firms	24	31	31	42	54	115	166
Average across firms	8.08	6.31	5.52	7.52	3.70	6.12	5.03
Firms paying dividends	17	25	30	41	36	106	158
Average across dividend paying firms	11.40	7.83	5.71	7.70	5.54	6.64	5.28
Panel B: Value-weighted averages							
Value-weighted average across all firms and issues	11.28	6.00	5.10	6.69	4.64	5.30	4.27
Lamberton yield	9.40	7.01	5.76	8.21	6.11	7.03	6.14
Ratio of value-weighted average to Lamberton yield	1.20	0.86	0.89	0.82	0.76	0.75	0.70
Missing issues	0	8	0	2	1	1	0

Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

Like Table 2.4, Table 2.5 indicates that an equally weighted average of the yields on stocks does not always lie above a value-weighted average. Also, in only two of the seven years does the ratio of a value-weighted average to Lamberton's yield fall below the adjustment

factor that Brailsford, Handley and Maheswaran (2008, 2012) use of 0.75. [55] The average ratio over the seven years is 0.82 and, more importantly, the ratio tends to be high when yields are high.

Table 2.5
Dividend yield estimates for 1891 to 1951 computed using firms that Brailsford, Handley and Maheswaran (2012) employ in constructing their price series

	1891	1901	1911	1921	1931	1941	1951
Panel A: Equally weighted averages							
Issues	9	12	22	36	48	128	201
Average across issues	10.80	5.30	5.51	8.01	3.77	5.98	4.56
Issues paying dividends	9	10	21	35	30	116	169
Average across dividend paying issues	10.80	6.36	5.78	8.23	6.03	6.60	5.42
Firms	7	10	21	33	44	115	166
Average across firms	11.84	5.92	5.41	7.89	3.44	6.12	5.03
Firms paying dividends	7	9	20	32	26	106	158
Average across dividend paying firms	11.84	6.57	5.68	8.13	5.82	6.64	5.28
Panel B: Value-weighted averages							
Value-weighted average across all firms and issues	8.97	5.78	5.26	7.37	4.39	5.30	4.27
Lamberton yield	9.40	7.01	5.76	8.21	6.11	7.03	6.14
Ratio of value-weighted average to Lamberton yield	0.95	0.83	0.91	0.90	0.72	0.75	0.70
Missing issues	0	0	0	2	1	1	0

Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

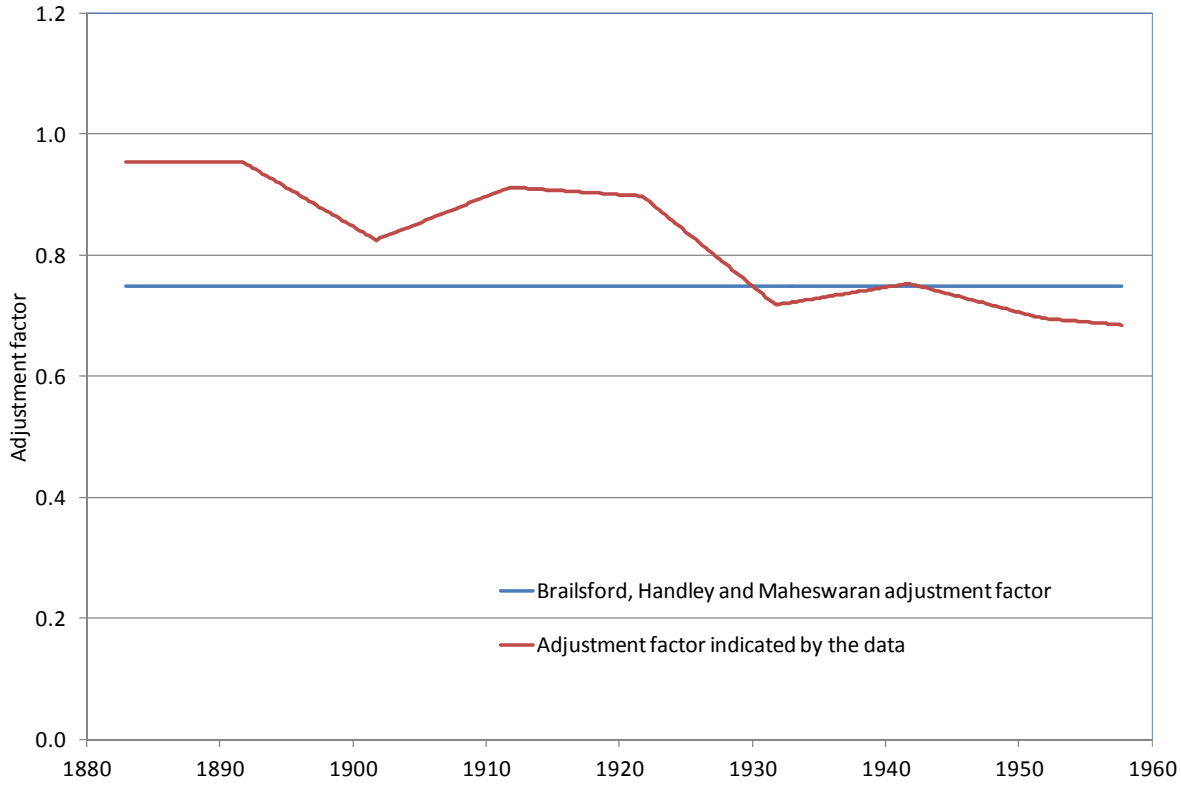
Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

[55] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

To produce an estimate of the adjustment that should be made to Lamberton's data each year to reflect our analysis and the analysis of Brailsford, Handley and Maheswaran (2008), we use linear interpolation.[56] Figure 2.1 plots the adjustment factors that we produce in this way against time. To be conservative, we do not use extrapolation to estimate the adjustment factor before 1891 but instead use the 1891 adjustment factor of 95.43 per cent.

Figure 2.1
Adjustment factors



Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

Brailsford, T., J. Handley and K. Maheswaran, Re-examination of the historical equity risk premium in Australia, Accounting and Finance 48, 2008, pages 73-97.

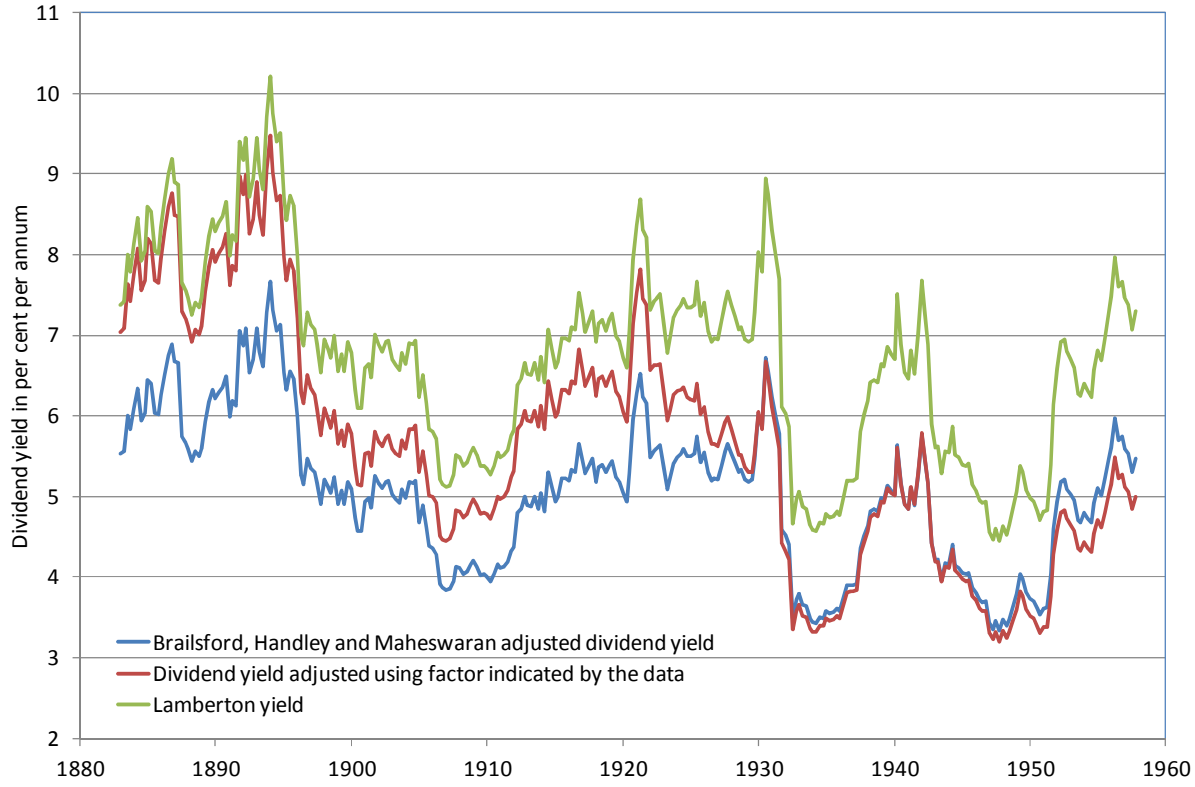
Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

Since the unadjusted Lamberton yield declines through time, the adjusted yield – the product of the unadjusted yield and the adjustment factor shown in Figure 2.1 – declines at an even faster pace. This feature of the data is illustrated in Figure 2.2. In addition, the impact on the arithmetic mean of the yields of adjusting the earlier yields by less is greater than the impact of adjusting the later yields by more. This is because the yields in the late 19th century were larger than the yields in the mid-20th century. Thus the impact of an upward adjustment to

[56] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

the yields from the late 19th century is greater than the impact of a downward adjustment to the yields from the mid-20th century.

Figure 2.2
Lamberton and adjusted dividend yields



Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

Brailsford, T., J. Handley and K. Maheswaran, Re-examination of the historical equity risk premium in Australia, Accounting and Finance 48, 2008, pages 73-97.

Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

Dimson, Marsh and Staunton (2012), like Officer (1989), use high-quality data provided by the AGSM from 1958 onwards.[57] So in this report we focus on the impact of an adjustment to the yields that Lamberton (1961) provides from 1883 to 1957 on estimates of the *MRP* that use the data that Dimson, Marsh and Staunton employ and on estimates of the *MRP* that use the data that Brailsford, Handley and Maheswaran (2008, 2012) employ.[58]

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[57] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2012*, Credit Suisse, February 2012.

Officer, R., *Rates of return to shares, bond yields and inflation rates: An historical perspective*, in Ball, R., P. Brown, F. Finn and R. Officer (Eds), *Share markets and portfolio theory*, Second edition, University of Queensland Press, 1989.

[58] Brailsford, T., J. Handley and K. Maheswaran, *Re-examination of the historical equity risk premium in Australia*, Accounting and Finance 48, 2008, pages 73-97.

To determine the impact, we recompute an estimate of the mean with-dividend return to the index that Lamberton (1958) provides using the factors that the data indicate that one should use to adjust Lamberton's (1961) yield series and compare this estimate to an estimate that uses an adjustment factor of 0.75.[59] Table 2.6 provides the results of this exercise.

Table 2.6 indicates that the impact of multiplying Lamberton's yield series by 0.75 is to lower an estimate of the mean return to the market computed using data from 1883 to 1957 from 12.02 to 10.18, that is, by 184 basis points. The impact of adjusting the yield series by factors indicated by the data rather than by 0.75 is to raise an estimate of the mean from 10.18 to 10.81, that is, by 63 basis points.

Table 2.6 also indicates that the impact of multiplying Lamberton's yield series by 0.75 is to lower an estimate of the mean return to the market computed using data from 1900 to 1957 from 12.11 to 10.37, that is, by 174 basis points. The impact of adjusting the yield series by factors indicated by the data rather than by 0.75, on the other hand, is to raise an estimate of the mean from 10.37 to 10.73, that is, by 36 basis points.

Table 2.6
Estimates of the return to the market portfolio

Adjustment factor	1883-1957	1900-1957
None	12.02	12.11
0.75	10.18	10.37
Indicated by the data	10.81	10.73

Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

Lamberton, D., Security prices and yields, Sydney Stock Exchange Official Gazette, 14 July 1958, pages 257-258.

Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

It follows that the impact of adjusting the yield series by factors indicated by the data rather than by 0.75 on estimates of the *MRP* that use data from 1900 to 2012 is to raise an estimate of the mean return to the market and so the *MRP* by:

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[59] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

$$36 \times \left(\frac{1957 - 1899}{2012 - 1899} \right) = 18 \,\text{basis points} \tag{5}$$

The impact of adjusting the yield series by factors indicated by the data rather than by 0.75 on estimates of the *MRP* that use data over the period from 1883 to 2012 on which the AER largely relies is to raise an estimate of the mean return to the market and so the *MRP* by:

$$63 \times \left(\frac{1957 - 1882}{2012 - 1882} \right) = 37 \,\text{basis points} \tag{6}$$

The larger impact on an estimate of the *MRP* computed using the longer series of data reflects the high yields on stocks in the late 19th century and the fact that the adjustment factor indicated by the data is considerably higher than 0.75 for the years prior to 1900.

Thus an estimate of the *MRP* computed using the data that Brailsford, Handley and Maheswaran (2012) supply for the period 1883 to 2010 and that we update to 2012, assuming a value of 35 cents is assigned to each dollar of imputation credits distributed, adjusted for the bias that we identify, will be 6.50 per cent per annum.[60, 61]

Table 2.7 provides a summary of the data that we construct. The mean nominal return to the market and the *MRP* both rise by 36 basis points when the dividend yields that Lamberton supplies are adjusted by amounts that are dictated by the data rather than by multiplying them by an adjustment factor of 0.75. The mean real return to the market rises by 37 basis points.

[60] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[61] This value is the value laid down by the ACT in a decision on the market value of a one-dollar credit distributed. See ACT, Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, May 2011.

Table 2.7
The impact of adjusting dividend yields in different ways: 1883-2012

	Nominal market return	Real market return	Nominal risk-free rate	*MRP*
BHM	11.76	8.50	5.62	6.14
	(1.46)	(1.50)	(0.26)	(1.45)
NERA	12.12	8.87	5.62	6.50
	(1.46)	(1.51)	(0.26)	(1.45)

Notes: The row labelled BHM adjusts the series of dividend yields that Lamberton supplies by multiplying them by 0.75. The row labelled NERA adjusts the dividend yields that Lamberton supplies by amounts that are dictated by the data. Data for 2011 and 2012 are constructed in the way that Brailsford, Handley and Maheswaran (2012) describe. All estimates are in per cent per annum and are computed using data from 1883 to 2012. Means are outside of parentheses while standard errors are in parentheses. The table assumes that the market places a value of 35 cents on each dollar of imputation credits distributed. [62]

Sources: The Australian Bureau of Statistics, Bloomberg, the Reserve Bank of Australia, various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

Brailsford, T., J. Handley and K. Maheswaran, The historical equity risk premium in Australia: Post-GFC and 128 years of data, Accounting and Finance, 2012, pages 237-247.

Lamberton, D., Security prices and yields, Sydney Stock Exchange Official Gazette, 14 July 1958 and 14 August, pages 257-258.

Lamberton, D., Ordinary share yields: A new statistical series, Sydney Stock Exchange Official Gazette, 14 July 1961.

[62] This value is the value laid down by the ACT in a decision on the market value of a one-dollar credit distributed. See ACT, Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, May 2011.

3. AER's Proposed Method

To compute an estimate of an *MRP* consistent with prevailing market conditions, the AER proposes to rely on: [63]

- historical data on the returns to a portfolio of stocks in excess of the 10-year CGS yield;
- DGM estimates;
- survey evidence;
- implied volatility; and
- recent determinations by Australian regulators.

In this section we assess whether relying on this information will enable the AER to estimate an *MRP* consistent with prevailing market conditions.

3.1. Historical Data

On average through time the AER should set the *MRP* at its unconditional mean. Some of the time, if market conditions dictate, the AER should set the *MRP* above its unconditional mean and some of the time, if markets conditions dictate, the AER should set the *MRP* below its unconditional mean. On average through time, though – that is, not in every year but on average – the AER should set the *MRP* at its unconditional mean. It follows that a precise and unbiased estimate of the unconditional mean can be useful in judging whether an estimate of the conditional mean appears reasonable. [64,65] On average one would not expect an estimate of the conditional *MRP* to sit below an unbiased estimate of the *MRP*'s unconditional mean. An estimator of a parameter is said to be unbiased if the expected value of the estimator matches the parameter.[66] The precision of a random variable is the reciprocal of its variance.[67] All else constant an unbiased estimator will be preferred to a biased

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[63] AER, *Explanatory statement: Draft rate of return guidelines*, August 2013, page 212.

[64] An estimator of a parameter is said to be unbiased if the expected value of the estimator matches the parameter. See, for example:

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

[65] The precision of a random variable is the reciprocal of its variance. See, for example,

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

[66] See, for example:

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

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

> 'accuracy or exactness.'

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

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

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

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

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

estimator and all else constant a more precise estimator will be preferred to a less precise estimator.

If, for example, the AER were to conclude that an *MRP* consistent with prevailing conditions were to sit 100 basis points below an estimate of the *MRP*'s unconditional mean, then one would want to discover what information the regulator had used to reach such a conclusion and whether the information was reliable.

The AER has in the past, though, followed a policy of keeping the *MRP* approximately constant through time and in recent reports its advisors have defended the policy. The AER's advisors have argued that they believe that there is insufficient evidence that the *MRP* varies through time to warrant the adoption of a different strategy.

Our appraisal of the existing literature is that there is convincing evidence that the *MRP* varies through time. We review some of this evidence below and note that there is evidence that simple versions of the DGM are useful in predicting the return to the market portfolio in excess of the risk-free rate.

3.2. DGM

3.2.1. Simple models

The intuition behind the DGM is that market prices must reflect the dividends that investors expect to receive in future years but also the returns that the investors require. It follows that if one knows the price of a portfolio and one has a set of forecasts of the dividends that the portfolio will deliver, one can compute an estimate of the return that investors will require on the portfolio.

A simple version of the DGM states that the real return required on the market portfolio must be the sum of the forward dividend yield and the long-term real growth in dividends. That is, a simple version states that:

$$R = \frac{D(1+g)}{P} + g \ , \tag{7}$$

where R is the real return required on the market portfolio, D/P is the current dividend yield and g is the long-term real growth in dividends.

An alternative to this simple model is a model in which the real growth in dividends is a function of the payout ratio and the accounting return on equity. In long-term equilibrium

$$g = \left(1 - \frac{D}{E}\right) ROE \ , \tag{8}$$

where D/E is the payout ratio and ROE is the accounting return on equity. Campbell and Thompson (2008) find evidence from US data that models of this form can provide better out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate

than an estimate of the return based on the sample mean of a series of historical excess returns. [68]

3.2.2. Welch and Goyal (2008) and Campbell and Thompson (2008)

The evidence that Campbell and Thompson (2008) provide is particularly important as Welch and Goyal (2008) argue that providing out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate that can outperform an estimate of the return based on the sample mean of a series of historical excess returns is difficult. [69] The AER, and its advisors have made frequent references to the work of Welch and Goyal as supporting the idea that the best estimate of the *MRP* that one can form is an estimate based on the sample mean of a series of historical excess returns. Thus it is worth examining in detail the work of Welch and Goyal and also the work of Campbell and Thompson – particularly as the two papers reach different conclusions but sit side by side in the same issue of the *Review of Financial Studies*.

A close examination of the work of Welch and Goyal (2008) and Campbell and Thompson (2008) reveals that the primary differences between the two papers are that: [70]

- Campbell and Thompson conclude that there is evidence that one can forecast the return to the market portfolio in excess of the risk-free rate out of sample whereas Welch and Goyal conclude that one cannot;
- Campbell and Thompson and Welch and Goyal place different restrictions on the length of the time series used to construct a forecast; and
- Campbell and Thompson find that valuation models provide better forecasts of the return to the market portfolio in excess of the risk-free rate than the sample mean of a series of historical excess returns whereas Goyal and Welch do not consider forecasts generated by valuation models.

Welch and Goyal (2008) examine a large number of predictive regressions and find that few of the regressions provide forecasts of the return to the market portfolio in excess of the risk-free rate that are superior in a mean-squared error sense than forecasts provided by the sample mean of a series of historical excess returns. [71] Goyal and Welch do not consider valuation models.

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[68] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[69] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

[70] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

[71] The mean squared error of a forecast is the average of the squared errors that the forecast generates.

Campbell and Thompson (2008) consider 11 different valuation models and find that in both monthly data and annual data the out-of-sample R^2 attached to the 'fixed-coefficient' forecasts that the valuation models make of the return to the market portfolio in excess of the risk-free rate are uniformly positive. [72, 73] In other words, forecasts that the valuation models deliver of the return to the market portfolio in excess of the risk-free rate are uniformly superior to the forecasts provided by the sample mean of a series of historical excess returns. The fixed-coefficient forecasts are forecasts that use the models directly and so do not require that one estimate regression parameters. Campbell and Thompson do not provide out-of-sample tests of significance. Their results, however, imply unambiguously that, using all of the data at their disposal, one cannot reject the hypothesis that valuation models provide forecasts of the return to the market portfolio in excess of the risk-free rate that are either identical or better in a mean squared error sense than forecasts generated by the sample mean of a series of historical excess returns.

Surprisingly, in his recent report for the AER, Gibbard (2013) makes numerous references to the work of Welch and Goyal (2008) but only one indirect reference to the work of Campbell and Thompson (2008). [74]

3.2.3. Multi-stage models

An alternative to a single-stage DGM is a model in which short-term forecasts of real dividend growth are combined with a long-term assumption about real dividend growth and an assumption about the time that it takes for the short-term to evolve into the long-term. Li, Ng and Swaminathan (2013) examine whether a multi-stage model can forecast the excess return to the market portfolio and find evidence that is statistically significant that it can at horizons of up to four years. [75]

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

[72] The out-of-sample R^2 attached to a forecast is given by:

$$R^2_{OS} = 1 - \left[\sum_{t=1}^{T}(r(t)-\bar{r}(t))^2\right]^{-1} \sum_{t=1}^{T}(r(t)-\hat{r}(t))^2,$$

where $r(t)$ is the return to the market portfolio from time t-1 to t in excess of the risk-free rate, $\bar{r}(t)$ is the sample mean of a series of historical excess returns and $\hat{r}(t)$ is the forecast.

[73] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[74] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Gibbard, P., *Estimating the market risk premium in regulatory decisions: Conditional versus unconditional estimates*, ACCC/AER Working paper, September 2013.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

[75] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

3.2.4. Dividend growth

While we note that there is evidence that the DGM can track variation in the *MRP* through time, the models that we describe above require as an input an estimate of the long-run real growth in dividends. There is, however, uncertainty about what constitutes a reasonable value for long-run real dividend growth. While this uncertainty may not pose a significant problem for an investor who wishes to use the DGM for his or her own purposes, it may pose a problem for the regulatory process. An institution that seeks to produce an estimate of the *MRP* that is high may find a relatively high estimate of long-run growth to be attractive because a high estimate will generate a correspondingly high estimate of the *MRP*. Similarly, an institution that seeks an estimate of the *MRP* that is low may find a relatively low estimate of long-run growth to be attractive because a low estimate will generate a correspondingly low estimate of the *MRP*.

SFG (2013) provide a method, based on the work of Fitzgerald, Gray, Hall and Jeyaraj (2013) that provides a purely mechanical way of determining what the market considers to be long-run growth. [76] They use analyst forecasts to back out what the market believes for each firm to be the cost of equity, long-run growth and the accounting return to equity. One of the attractions of their method is that because long-run growth is estimated from currently available market data, the discretion to manipulate estimates of long-run growth is largely eliminated. We believe that the AER should use a DGM to estimate the *MRP* and that it should use a method, like the method that SFG outlines, that will remove any incentives that might otherwise exist to manipulate estimates of long-run growth.

3.3. Survey evidence

The AER has for some time relied in part on survey evidence to determine the *MRP*. We emphasise in our June 2013 report that there are a number of problems with the surveys that the AER typically cites: [77]

- the surveys that the AER cites often do not explain how those surveyed were chosen;
- a majority of those surveyed in the surveys that the AER cites did not respond;
- it is unclear what incentives were provided to individuals contacted by the surveys that the AER cites to ensure that respondents would provide accurate responses;
- it is generally unclear whether respondents are supplying estimates of the *MRP* that they base on arithmetic means or geometric means;
- it is often unclear what value respondents place on imputation credits;
- it often unclear what risk-free rate respondents use; and importantly
- it is unclear how relevant some of the surveys that the AER cites are because of changes in market conditions since the time at which the surveys were conducted.

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[76] Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

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

[77] NERA, *Market, size and value premiums: A report for the ENA*, June 2013.

The Australian Competition Tribunal (ACT) also urges the AER to treat the results of surveys with caution. For example, the ACT states that: [78]

> 'Surveys must be treated with great caution … consideration must be given at least to … the number of respondents, the number of non-respondents and the timing of the survey.'
>
> 'When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.'

The AER states in its *Consultation Paper*, on the other hand, that: [79]

> 'Survey based estimates may be subjective, because market practitioners may look at a range of different time horizons and they are likely to have differing views on the market risk. This concern may be mitigated as the sample size increases.'

This statement assumes that the error with which surveys estimate the *MRP* can be diversified away across surveys. This need not be true. For example, if most of the surveys were conducted at a time when the *MRP* was low, then they will tend to underestimate the *MRP* and the error that they make in estimating the current *MRP* will not be diversified away.

An estimate of the *MRP* based on the geometric mean of a series of returns to the market portfolio can sit 200 basis points below an estimate that is based on the arithmetic mean. [80] We show in out June 2013 report that an estimate of the *WACC* that is based, in part, on the arithmetic mean of a sample of annual returns to the market portfolio will produce an unbiased estimate of the true *WACC* and so will lead the present value principle to be on average satisfied. In contrast, an estimate of the *WACC* that is in part based on an estimate of the *MRP* that places a positive weight on the geometric mean of a sample of annual returns to the market portfolio will produce a downwardly biased estimate of the true *WACC* and will lead the present value principle to be on average violated. If survey respondents supply estimates of the *MRP* that are based on the geometric mean of a sample of annual returns to the market portfolio, then the use of the survey responses will lead the present value principle to be on average violated. Note that Dimson, Marsh and Staunton (2013) place as much emphasis on geometric means as on arithmetic means and so it is quite possible that some survey respondents will supply what they know to be geometric means computed from past data. [81]

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[78] Australian Competition Tribunal, *Application by Envestra Limited (No 2) [2012] ACompT 3*, 11 January 2012, paragraphs 165–166.

[79] AER, *Consultation paper: Rate of return guidelines*, May 2013, page 81.

[80] See, for example,

Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

[81] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

3.4. Implied Volatility

We note in a 2011 report that there is strong evidence that implied volatility can track variation in market volatility and that there is weak evidence in US data that implied volatility can track variation through time in the *MRP*.

Blair, Poon and Taylor (2001), for example, find that there is a positive relation between implied volatility and future volatility and that implied volatility better forecasts future volatility than other measures. They state that:[82]

> 'The in-sample estimates show that nearly all relevant information is provided by the VIX index and hence there is not much incremental information in high-frequency index returns. For out-of-sample forecasting, the VIX index provides the most accurate forecasts for all forecast horizons and performance measures considered.'

The VIX is the ticker symbol for the Chicago Board Options Exchange Market Volatility Index, a measure of the implied volatility of the S & P 500 index.

Guo and Whitelaw (2006) also report the same sort of results. [83] They conclude that:[84]

> 'it is clear that implied variance is the best single predictor [of realized volatility] and that little is lost by excluding the other explanatory variables. Consequently, we select the implied variance as the single explanatory variable in the variance equation.'

The fact that implied volatility provides an upwardly biased forecast of future volatility, while of interest, need not generate a significant problem for forecasting if forecasts of future volatility can be adjusted for the bias. Guo and Whitelaw (2006), for example, adjust for the bias. They state that:[85]

> 'If implied variance is a conditionally unbiased predictor of future variance, then in Table I the intercept in the last regression should be equal to zero and the coefficient on implied variance should be equal to one. However, an extensive literature documents positive intercepts and slopes less than unity in similar regressions ... Table I shows that while the estimated coefficient is positive, it is significantly less than one, and the intercept is significantly positive, although it is small. Thus, while implied volatility may be informationally efficient relative to other variables it is not conditionally unbiased. As a result, we use the fitted value from this estimation as our proxy for conditional variance in the estimation of the full model.'

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[82] Blair, B., Poon, S.-H., and Taylor, S. (2001), "Forecasting S&P 500 Volatility: The Incremental Information Content of Implied Volatilities and High-Frequency Index Returns," *Journal of Econometrics*, 105, 5–26.

[83] Guo, H. And R. Whitelaw, Uncovering the risk-return relation in the stock market, Journal of Finance, 2006, pages 1433-1463.

[84] Guo, H. And R. Whitelaw, Uncovering the risk-return relation in the stock market, Journal of Finance, 2006, page 1446.

[85] Guo, H. And R. Whitelaw, Uncovering the risk-return relation in the stock market, Journal of Finance, 2006, page 1446.

Guo and Whitelaw also find a positive but insignificant relation between the *MRP* and implied volatility. For example, using the VIX as a measure of risk and data from 1984 through 2001 summarize their results in the following way: [86]

> 'Model 1 is the standard risk-return model estimated in much of the literature, that is, a regression of returns on a measure of the conditional variance. However, in contrast to many existing results, we find a coefficient that is positive, albeit statistically insignificant, and reasonable in magnitude. If the hedge component is unimportant or orthogonal to the risk component, the coefficient value of 2.5 represents an estimate of the coefficient of relative risk aversion of the representative agent; however, this estimate may be biased downwards slightly due to measurement error in the conditional variance.'

Banerjee, Doran and Peterson (2007), on the other hand, using data from 1987 through 2005 find a significant positive relation between the VIX and future S & P 500 returns in excess of the risk-free rate.[87] They state that: [88]

> 'Before testing the characteristic portfolios, we examine if VIX levels and innovations predict future market excess returns. To test this hypothesis, and confirm the results in Giot (2005), the 30-day and 60-day excess returns on the S&P 500 are regressed on the VIX variables.15 The regressions are identical to those in Eqs. (17a) and (17b), except the dependent variable is the return on the S&P 500. The results are reported in Table 1 and show significantly positive coefficients on the VIX level at the 5% level. They are not surprising and consistent with prior findings related to VIX and future returns.'

The difference between the results of Guo and Whitelaw (2006) and Banerjee, Doran and Peterson (2007) must stem from their use of different time periods because there is little difference in the specifications that they use. Despite the difference between the results, the two pieces of evidence, particularly the second piece of evidence, suggest that there is some support for a link between the *MRP* and a measure of implied volatility. While this may be true, however, it is unclear whether implied volatility provides information not already contained in DGM estimates of the *MRP*.

3.5. Regulator Decisions

While it makes sense for the AER to be cognisant of decisions that other regulators make both in Australia and abroad and to understand the rationales behind the decisions, the AER should not base decisions about the *MRP* on decisions made by other regulators. It is difficult to understand why, for example, it would make sense for the AER to set the *MRP* at a level that is below an *MRP* consistent with prevailing conditions simply because another regulator had done so. The AER should base its decisions solely on an analysis of market data. These data should include historical data, current market data and analyst forecasts.

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[86] Guo, H. And R. Whitelaw, Uncovering the risk-return relation in the stock market, Journal of Finance, 2006, page 1448.

[87] Doran, J., P. Banerjee and D. Peterson, Implied volatility and future portfolio returns, Journal of Banking and Finance, 2007, pages 3183–3199.

[88] Doran, J., P. Banerjee and D. Peterson, Implied volatility and future portfolio returns, Journal of Banking and Finance, 2007, page 3190.

3.6. Other Evidence

Campbell and Thompson (2008) provide evidence that once sensible constraints are placed on the signs of coefficients and on return forecasts, many predictive regressions provide forecasts of the return to the market portfolio in excess of the risk-free rate that beat, on an out-of-sample basis, estimates that are based on the sample mean of a series of historical excess returns.[89] Li, Ng and Swaminathan (2013) provide in-sample evidence, however, that forecasts of the return to the market portfolio in excess of the risk-free rate provided by a multi-stage valuation model provide information that is not supplied by variables that include the dividend yield, default spread bill rate and term spread.[90] Their evidence suggests that one can do no better than use the forecast provided by a valuation model – at least so long as the valuation model is properly specified.

[89] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[90] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

4. Conclusions

This report has been prepared for the Energy Networks Association (ENA) by NERA Economic Consulting (NERA). The ENA has asked NERA to assess the methodology that the Australian Energy Regulator (AER) has laid out in its *Draft Rate of Return Guideline* to estimate a market risk premium (*MRP*) consistent with prevailing conditions.

In particular, the ENA has asked NERA to assess the extent to which the AER's proposal to rely on: [91]

- historical data on the returns to a portfolio of stocks in excess of the yield on a 10-year Commonwealth Government Security (CGS);
- DGM estimates;
- survey evidence;
- implied volatility; and
- recent determinations by Australian regulators

will enable the AER to construct an unbiased estimate of an *MRP* consistent with prevailing conditions.

The ENA has also asked NERA to assess whether there is evidence on which the AER does not intend to rely that would be relevant in determining an appropriate estimate of the *MRP* computed relative to the 10-year CGS yield.

Finally, the ENA has asked NERA to assess the argument that its advisors have advanced that one cannot provide a better estimate of an *MRP* consistent with prevailing conditions than an historical average of the returns to a portfolio of stocks in excess of the 10-year CGS yield.

Historical Data

On average through time the AER should set the *MRP* at its unconditional mean. Some of the time, if market conditions dictate, the AER should set the *MRP* above its unconditional mean and some of the time, if markets conditions dictate, the AER should set the *MRP* below its unconditional mean. On average through time, though – that is, not in every year but on average – the AER should set the *MRP* at its unconditional mean. It follows that a precise and unbiased estimate of the unconditional mean can be useful in judging whether an estimate of the conditional mean appears reasonable. [92,93] On average one would not expect an estimate of the conditional *MRP* to sit below an unbiased estimate of the *MRP*'s unconditional mean. If, for example, the AER were to conclude that an *MRP* consistent with

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[91] AER, *Explanatory statement: Draft rate of return guidelines*, August 2013, page 212.

[92] An estimator of a parameter is said to be unbiased if the expected value of the estimator matches the parameter. See, for example:

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

[93] The precision of a random variable is the reciprocal of its variance. See, for example,

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

prevailing conditions were to sit 100 basis points below an estimate of the *MRP*'s unconditional mean, then one would want to discover what information the regulator had used to reach such a conclusion and whether the information was reliable.

Dimson, Marsh and Staunton (2012) and Brailsford, Handley and Maheswaran (2012) provide two different estimates of the long-run mean return to a value-weighted portfolio of Australian stocks.[94] In their Credit Suisse Global Investment Returns Sourcebook 2013, Dimson, Marsh and Staunton report that the arithmetic mean of the annual return to a value-weighted portfolio of Australian stocks, exclusive of imputation credits, from 1900 to 2012, is 13.0 per cent. The arithmetic mean of the series of annual returns to a value-weighted portfolio of Australian stocks that Brailsford, Handley and Maheswaran supply and that we update, exclusive of imputation credits, from 1900 to 2012, is 12.0 per cent. Thus the arithmetic mean of the series of annual returns that Brailsford, Handley and Maheswaran supply is 100 basis points below the arithmetic mean of the series that Dimson, Marsh and Staunton use.

The difference between the two arithmetic means is primarily explained by differences in the way in which the dividends distributed by a value-weighted portfolio of stocks were determined by those who provided the data to the two sets of authors. Dimson, Marsh and Staunton (2013) use a series of dividend yields provided to them by Officer that is largely based on a series produced by Lamberton (1961).[95] Brailsford, Handley and Maheswaran (2012) use a series of yields provided to them by the Australian Stock Exchange that is also largely based on Lamberton's data.[96] The yields that Brailsford, Handley and Maheswaran use, however, have been adjusted downwards to take account of perceived deficiencies in the series that Lamberton provides.

We assess whether the adjustment to Lamberton's yield series in the data that Brailsford, Handley and Maheswaran employ is warranted and provide evidence that it is not. The evidence suggests that some adjustment should be made but that the adjustment should be *smaller* than the adjustment made in their data. An estimate of the downwards bias generated by inappropriately adjusting Lamberton's yield series is 18 basis points for the period that Dimson, Marsh and Staunton examine, 1900 to 2012, but 36 basis points for the longer period, 1883 to 2012, on which the AER in large part focuses.

Our estimates of the downward bias rely on Lamberton's series, Brailsford, Handley and Maheswaran's analysis of yield data for February 1966, our analysis of yield data for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941, December 1951 and interpolation.

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[94] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[95] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

[96] Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

An estimate of the *MRP* computed using the data that Brailsford, Handley and Maheswaran (2012) supply for the period 1883 to 2010 and that we update to 2012, assuming a value of 35 cents is assigned to each dollar of imputation credits distributed, adjusted for the bias that we identify, will be 6.50 per cent per annum.[97, 98]

DGM

The intuition behind the DGM is that market prices must reflect the dividends that investors expect to receive in future years but also the returns that the investors require. It follows that if one knows the price of a portfolio and one has a set of forecasts of the dividends that the portfolio will deliver, one can compute an estimate of the return that investors will require on the portfolio.

We note that Campbell and Thompson (2008) find evidence from US data that even simple valuation models can provide better out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate than an estimate of the return based on the sample mean of a series of historical excess returns. [99] The evidence that Campbell and Thompson (2008) provide is particularly important as Welch and Goyal (2008) argue that providing out-of-sample forecasts of the return to the market portfolio in excess of the risk-free rate that can outperform an estimate of the return based on the sample mean of a series of historical excess returns is difficult. [100]

Campbell and Thompson (2008) consider 11 different valuation models and find that in both monthly data and annual data the out-of-sample R^2 attached to the 'fixed-coefficient' forecasts that the valuation models make of the return to the market portfolio in excess of the risk-free rate are uniformly positive. [101, 102] In other words, forecasts that the valuation models deliver of the return to the market portfolio in excess of the risk-free rate are uniformly superior to the forecasts provided by the sample mean of a series of historical

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97 Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

98 This value is the value laid down by the ACT in a decision on the market value of a one-dollar credit distributed. See ACT, Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9, May 2011.

99 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

100 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

Welch, I. and A. Goyal, *A comprehensive look at the empirical performance of equity premium prediction*. The Review of Financial Studies, 2008, pages 1455-1508.

101 The out-of-sample R^2 attached to a forecast is given by:

$$R^2_{OS} = 1 - \left[\sum_{t=1}^{T}(r(t)-\bar{r}(t))^2\right]^{-1}\sum_{t=1}^{T}(r(t)-\hat{r}(t))^2,$$

where $r(t)$ is the return to the market portfolio from time t-1 to t in excess of the risk-free rate, $\bar{r}(t)$ is the sample mean of a series of historical excess returns and $\hat{r}(t)$ is the forecast.

102 Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

excess returns. The fixed-coefficient forecasts are forecasts that use the models directly and so do not require that one estimate regression parameters. [103]

An alternative to the single-stage valuation models that Campbell and Thompson (2008) use is a model in which short-term forecasts of real dividend growth are combined with a long-term assumption about real dividend growth and an assumption about the time that it takes for the short-term to evolve into the long-term. [104] Li, Ng and Swaminathan (2013) examine whether a multi-stage model can forecast the excess return to the market portfolio and find evidence that is statistically significant that it can at horizons of up to four years. [105]

While there is evidence that the DGM can track variation in the *MRP* through time, simple models typically require as an input an estimate of the long-run real growth in dividends. There is, however, uncertainty about what constitutes a reasonable value for long-run real dividend growth. While this uncertainty may not pose a significant problem for an investor who wishes to use the DGM for his or her own purposes, it may pose a problem for the regulatory process. An institution that seeks to produce an estimate of the *MRP* that is high may find a relatively high estimate of long-run growth attractive because a high estimate will generate a correspondingly high estimate of the *MRP*. Similarly, an institution that seeks an estimate of the *MRP* that is low may find a relatively low estimate of long-run growth attractive because a low estimate will generate a correspondingly low estimate of the *MRP*.

SFG (2013) provide a method, based on the work of Fitzgerald, Gray, Hall and Jeyaraj (2013) that provides a purely mechanical way of determining what the market considers to be long-run growth. [106] They use analyst forecasts to back out what the market believes for each firm to be the cost of equity, long-run growth and the accounting return to equity. Their method is attractive because long-run growth is estimated from currently available market data and so the ability to manipulate estimates of long-run growth is largely eliminated. We believe that the AER should use a DGM to estimate the *MRP* and that it should use a method, like the method that SFG outlines, that will remove any incentives that might otherwise exist to manipulate estimates of long-run growth.

Surveys

We emphasise that there are a number of problems with surveys that ask individuals about their views on the *MRP* and that these include that:

- surveys often do not explain how those surveyed were chosen;
- a majority of those surveyed typically do not respond;

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[103] In other words, the fixed-coefficients forecasts use the predictions of a valuation model and not linear functions that one must estimate of the predictions.

[104] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[105] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

[106] Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

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

- it is unclear what incentives are provided to individuals contacted by surveys to ensure that respondents will provide accurate responses;
- it is generally unclear whether respondents believe that they should supply estimates of the *MRP* that they base on arithmetic means or geometric means;
- it is often unclear what value respondents place on imputation credits;
- it often unclear what risk-free rate respondents use; and importantly
- it is unclear how relevant some surveys are because of changes in market conditions since the time at which the surveys were conducted.

We note that an estimate of the *MRP* based on the geometric mean of a series of returns to the market portfolio can sit 200 basis points below an estimate that is based on the arithmetic mean. [107] We show in our June 2013 report that an estimate of the *WACC* that is based, in part, on the arithmetic mean of a sample of annual returns to the market portfolio will produce an unbiased estimate of the true *WACC* and so will lead the present value principle to be on average satisfied. In contrast, an estimate of the *WACC* that is in part based on an estimate of the *MRP* that places a positive weight on the geometric mean of a sample of annual returns to the market portfolio will produce a downwardly biased estimate of the true *WACC* and will lead the present value principle to be on average violated. If survey respondents supply estimates of the *MRP* that are based on the geometric mean of a sample of annual returns to the market portfolio, then the use of the survey responses will lead the present value principle to be on average violated. Dimson, Marsh and Staunton (2013) place as much emphasis on geometric means as on arithmetic means and so it is quite possible that some survey respondents will supply what they know to be geometric means computed from past data. [108]

Implied volatility

There is strong evidence that implied volatility can track variation in market volatility and some weak evidence in US data that implied volatility can track variation through time in the *MRP*. While this may be true, however, it is unclear whether implied volatility provides information not already contained in DGM estimates of the *MRP*.

Regulator Decisions

While it makes sense for the AER to be cognisant of decisions that other regulators make both in Australia and abroad and to understand the rationales behind the decisions, the AER should not base decisions about the *MRP* on decisions made by other regulators. It is difficult to understand why, for example, it would make sense for the AER to set the *MRP* at a level that is below an *MRP* consistent with prevailing conditions simply because another

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[107] See, for example,

Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

[108] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

regulator had done so. The AER should base its decisions solely on an analysis of market data. These data should include historical data, current market data and analyst forecasts.

Other Evidence

Campbell and Thompson (2008) provide evidence that once sensible constraints are placed on the signs of coefficients and on return forecasts, many predictive regressions provide forecasts of the return to the market portfolio in excess of the risk-free rate that beat, on an out-of-sample basis, estimates that are based on the sample mean of a series of historical excess returns. [109] Li, Ng and Swaminathan (2013) provide in-sample evidence, however, that forecasts of the return to the market portfolio in excess of the risk-free rate provided by a multi-stage valuation model provide information that is not supplied by variables that include the dividend yield, default spread bill rate and term spread. [110] Their evidence suggests that one can do no better than use the forecast provided by a valuation model – at least so long as the valuation model is properly specified. We believe that the model that SFG (2013) provide, that is based on the work of Fitzgerald, Gray, Hall and Jeyaraj (2013), is such a model. [111]

[109] Campbell, J. and S.B. Thompson, *Predicting excess stock returns out of sample: Can anything beat the historical average?* Review of Financial Studies, 2008, pages 1509-1531.

[110] Li, Y., D. Ng, and B. Swaminathan, *Predicting market returns using aggregate implied cost of capita*l, Journal of Financial Economics, 2013.

[111] Fitzgerald, T., S. Gray, J. Hall and R. Jeyaraj, *Unconstrained estimates of the equity risk premium*, Review of Accounting Studies, 2013.

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

Appendix A. Contents of Disk Provided to the AER

In July 2013, we provided the AER with a disk containing the data and programs that we use to estimate the dividend yield for a range of years for the value-weighted Commercial and Industrial index assembled by Lamberton (1958) from 1882 to 1957. [132] In this report we update the data, that Brailsford, Handley and Maheswaran (2012) provide and that we adjust, for a further year and so we are providing a marginally updated version of the disk to the AER. [133] Each folder on the disk contains a text file 'README.TXT' describing the contents of the folder. This appendix, for clarity, also describes the contents of the disk.

To understand how we collect the data that we use, one must first go to the workbook 'Dividend Data.xlsx' that resides in the folder 'Analysis/XLS'. The workbook contains a worksheet entitled 'Notes' that describes how the data are assembled. Each year for which we collect data has a worksheet dedicated to it and each year uses, for simplicity, a colour code indicating the source of the data. The colour codes that we use are described in the worksheet 'Colours'. A further worksheet entitled 'Footnotes' provides additional details while the worksheets 'All 1875-1936' and 'All 1936-1957' contain lists of the stocks that Lamberton uses drawn from:

> Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, pages 85-90.
>
> Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 August 1958, page 307.

Dividend yields for the value-weighted Commercial and Industrial index assembled by Lamberton (1958) from 1882 to 1957 are contained in the worksheet 'Analysis'. [134] The worksheet also contains the dividend yield for a value-weighted index of all the stocks that Lamberton uses to construct his original yield series.

Also contained in the folder 'Analysis/XLS' is a file entitled 'Analysis.xlsm' that constructs an updated version of the data that Brailsford, Handley and Maheswaran (2012) provide, exclusive of imputation credits, adjusted in the way that we describe in section 2. [135] The file also compares the without-dividend

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[132] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.

[133] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

[134] Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958.

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.

[135] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

returns that we construct from the data that Wren Advisers provide with the data that Brailsford, Handley and Maheswaran provide and shows that the two series are all but identical. [136] The file 'BHM Update' contains an updated version of the data that Brailsford, Handley and Maheswaran provide, inclusive of imputation credits, again, adjusted in the way that we describe in section 2.

The folder 'Analysis\SAS' contains programs that compute summary statistics for the yields that we collect. The folder 'Analysis\TXT' contains text files containing the data, in convenient form, from the workbook 'Dividend Data.xlsx' that resides in the folder 'Analysis/XLS'.

The folder entitled 'Brailsford, Handley & Maheswaran' contains the programs and data necessary to update the data that Brailsford, Handley and Maheswaran (2012) provide for the years 2011 and 2012. [137]

The folders 'Lamberton' and 'SSE Official Gazette' contain copies of the following publications of Lamberton:

> Lamberton, D., *Some statistics of security prices and yields in the Sydney market, 1875-1955*, Economic Record, pages 253-259.
>
> Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958.
>
> Lamberton, D., *Security prices and yields*, Sydney Stock Exchange Official Gazette, 14 July 1958, pages 257-258 and 14 August 1958, page 307.
>
> Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

The folder 'SSE Official Gazette' also contains a workbook that contains the data which Lamberton supplies and that appears in the Gazette.

The folders 'Australasian I & B Record', SSE Stock & Share List', 'Thompson & Sons' and 'Trove' provide photos or pdf copies of the relevant extracts from various journals and newspapers from which we take the data that we use.

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[136] Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.

http://www.wrenadvisers.com.au/downloads/files/mxaoi.csv

[137] Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2013*, Credit Suisse, February 2013.

Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

Appendix B. Annual Data

This appendix provides the annual data that we construct from:

- the time series of price indices supplied by Wren Advisers;
- the yield series that Lamberton (1958, 1961) provides, adjusted in the way that we describe in section 2; and
- the data that Brailsford, Handley and Maheswaran (2012) provide.

The credit return is given by:

$$100 \times \frac{C(t)}{P(t-1)}, \tag{B.1}$$

where $C(t)$ are the credits distributed in year t and $P(t–1)$ is the level of the price index at the end of year t.

Year	Without-dividend return	With-dividend return	Credit return
1883	21.9	31.0	
1884	-1.7	6.1	
1885	4.7	13.2	
1886	-3.6	4.7	
1887	20.6	30.3	
1888	19.5	28.1	
1889	-6.8	0.5	
1890	-4.8	3.2	
1891	-15.9	-8.9	
1892	-0.7	8.1	
1893	-11.3	-3.3	
1894	2.9	12.4	
1895	12.6	21.7	
1896	-3.7	2.7	
1897	3.0	9.4	
1898	9.7	16.4	
1899	6.7	12.9	

1900	7.0	12.9	
1901	-7.9	-2.6	
1902	9.8	16.2	
1903	15.9	22.6	
1904	2.2	8.2	
1905	9.5	15.4	
1906	5.8	10.9	
1907	4.6	9.5	
1908	12.6	18.1	
1909	9.0	14.4	
1910	2.5	7.6	
1911	6.2	11.7	
1912	3.6	9.7	
1913	3.8	10.1	
1914	5.9	12.6	
1915	-8.3	-2.5	
1916	-8.4	-2.4	
1917	9.5	16.8	
1918	1.9	8.6	
1919	12.6	19.9	
1920	2.5	9.2	
1921	12.6	21.3	
1922	14.8	22.5	
1923	10.2	17.1	
1924	7.6	14.6	
1925	11.4	18.4	
1926	8.2	14.6	
1927	6.5	12.8	
1928	11.5	17.9	
1929	-10.1	-5.2	
1930	-33.9	-29.6	

1931	11.3	17.5	
1932	19.9	24.6	
1933	21.1	25.4	
1934	19.1	23.1	
1935	6.2	10.0	
1936	15.4	19.7	
1937	-1.7	2.4	
1938	-5.1	-0.6	
1939	0.2	5.3	
1940	-1.7	3.5	
1941	-10.1	-5.4	
1942	12.4	18.4	
1943	4.5	8.9	
1944	3.6	7.9	
1945	9.6	14.0	
1946	9.2	13.2	
1947	12.7	16.4	
1948	-1.1	2.3	
1949	4.0	7.9	
1950	26.7	31.1	
1951	-8.3	-4.8	
1952	-17.5	-13.6	
1953	7.7	12.6	
1954	13.1	18.2	
1955	4.7	9.8	
1956	1.7	7.2	
1957	10.5	16.2	
1958	12.9	18.9	
1959	38.1	44.3	
1960	-9.9	-6.2	
1961	6.6	11.6	

1962	-0.1	4.2	
1963	21.6	26.6	
1964	0.5	4.4	
1965	-12.1	-8.2	
1966	2.1	6.7	
1967	36.9	42.5	
1968	30.7	34.8	
1969	6.9	10.1	
1970	-16.7	-13.7	
1971	-9.8	-6.1	
1972	31.8	36.4	
1973	-28.7	-25.8	
1974	-30.9	-26.2	
1975	45.4	54.6	
1976	-2.0	3.6	
1977	6.6	13.2	
1978	17.6	24.3	
1979	32.0	39.0	
1980	45.8	52.3	
1981	-14.4	-10.8	
1982	-19.7	-15.3	
1983	56.6	63.7	
1984	-3.7	0.5	
1985	36.4	42.1	
1986	45.7	51.1	
1987	-12.1	-9.6	1.4
1988	16.1	21.1	3.8
1989	11.3	17.9	3.7
1990	-20.1	-15.3	2.6
1991	22.2	27.5	2.2
1992	-6.0	-2.2	1.9

1993	39.1	44.2	1.9
1994	-9.2	-5.8	1.3
1995	16.5	21.5	1.8
1996	7.2	11.7	1.8
1997	7.9	12.4	1.8
1998	7.7	11.9	1.5
1999	13.5	17.6	1.4
2000	2.9	6.5	1.4
2001	2.6	6.1	1.3
2002	-9.6	-6.2	1.1
2003	8.7	13.4	1.9
2004	22.8	27.8	1.4
2005	15.7	20.6	1.4
2006	19.8	24.9	1.5
2007	17.9	22.3	1.2
2008	-45.8	-43.3	1.1
2009	34.1	40.4	1.5
2010	2.2	6.4	1.2
2011	-12.4	-8.5	1.3
2012	8.6	13.8	1.6

Appendix C. Terms of Reference

TERMS OF REFERENCE – Variation in the MRP over time

Background

On 30th August 2013, the Australian Energy Regulator (AER) published its draft rate of return guideline that will form the basis of the regulated rate of return to be applied in energy network decisions made from 2014 onwards. Previously the AER published an Issues Paper on 18th December 2012 and a Consultation Paper on 10th May 2013.

Under the previous National Electricity Rules (NER), the AER was required to estimate the cost of equity for electricity network businesses using the Sharpe-Lintner (SL) version of the Capital Asset Pricing Model (CAPM). Although the previous National Gas Rules (NGR) did not mandate the use of the SL CAPM, in practice, the AER also applied this approach in gas network decisions. The market risk premium (MRP) plays an important role in the SL CAPM, as it does in other asset pricing models

The recently revised NER and NGR now require the AER to have regard to financial models generally, Clause 6.5.2 of the rules states:

> *(e) In determining the allowed rate of return, regard must be had to:*
>
> > *(1) relevant estimation methods, financial models, market data and other evidence;*
> >
> > *(2) the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and*
> >
> > *(3) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.*
>
> ***Return on equity***
>
> *(f) The return on equity for a regulatory control period must be estimated such that it contributes to the achievement of the allowed rate of return objective.*
>
> *(g) In estimating the return on equity under paragraph (f), regard must be had to the prevailing conditions in the market for equity funds.*

These clauses require the AER to consider all relevant financial models and therefore provide greater scope for the AER to look at cost of equity models beyond the traditionally adopted SL CAPM.

In its draft guideline the AER allows no role for the Fama-French three factor model, but states that it intends to use the Black CAPM, a model in which the MRP also plays an important role.

The AER states on page 212 of its draft guideline that in determining an appropriate estimate of the MRP, it will consider a broad range of evidence, including:

- Historical excess returns
- Dividend growth model (DGM)
- Survey evidence
- Implied volatility; and
- Recent determinations among Australian regulators.

On the other hand, the AER states on page 213 of its draft guideline that "recent empirical evidence suggests there may be no better predictor of excess returns than the historical average". Gibbard, in a report for the Australian Competition and Consumer Commission (ACCC) and the AER, similarly states on page 7 of the report that "in practice regulators may have grounds for using an unconditional rather than a conditional estimate of the MRP"[138].

The ENA is looking for expert consultants to provide a review of the academic literature and the arguments presented by the AER and its consultants on the MRP computed relative to the yield on a 10-year Commonwealth Government Security (CGS). In particular, the ENA wishes to receive advice on whether treating the MRP, for all practical purposes, as a constant through time will lead to estimates of the return to equity that are, as the NER and NGR require, consistent with prevailing conditions in the market for equity funds.

Scope of work

The consultant is to assess based on the existing literature, and on empirical work that he or she may conduct, the extent to which the evidence that the AER intends to use in determining an appropriate estimate of the MRP is relevant. For regulatory purposes, the MRP is computed relative to the 10-year CGS yield, and the range of evidence is likely to encompass:

- Historical excess returns
- DGM
- Survey evidence
- Implied volatility; and
- Recent determinations among Australian regulators

The consultant is also to assess whether there is evidence that the AER does not intend to use that would be relevant in determining an appropriate estimate of the MRP computed relative to the 10-year CGS yield.

Further, the consultant is to assess whether treating the MRP computed relative to the 10-year CGS yield, for all practical purposes, as a constant through time will lead to estimates of the return to equity that are, as the NER and NGR require, consistent with prevailing conditions in the market for equity funds. In particular, the consultant should examine the report of Gibbard for the ACCC and AER and assess whether the report provides a fair representation of what is currently known about the predictability of equity returns.

[138] Gibbard, P. (2013), Estimating the Market Risk Premium in Regulatory Decisions: Conditional versus Unconditional Estimates, ACCC/AER Working Paper Series, Working Paper no. 9, September 2013.

Relevant documents that the consultant will be required to consider include:

- Academic literature on the extent to which one can predict equity returns.
- The draft rate of return guideline and its supporting explanatory note.
- The expert consultant report, authored by Gibbard, commissioned by the ACCC and AER and released in September 2013
- The AER's draft and final decisions for the Multinet Gas 2013-2017 access arrangement review.
- Submissions to the AER's consultation paper prepared on behalf of the ENA. In particular, the respondent to these terms of reference should have regard for recent work undertaken by the Competition Economists Group and by NERA Economic Consulting.

The consultant should document the methods, data, adjustments and assumptions used and made. Specific estimates of the MRP will not necessarily be required, however, a response to AER criticisms may call for statistical testing and data analysis.

The final version of the report must be of sufficient standard that it can be submitted to the AER as part of the ENA's response to the AER's draft guideline.

Timeframe

The consultant is to provide a draft report by 30th September 2013.

A final report addressing any ENA comments is to be provided by 4 October 2013.

Reporting

Jeremy Rothfield will provide the primary interface to the ENA Cost of Capital Subgroup for the duration of the engagement. The consultant will report on work in progress on a regular basis. The consultant will make periodic presentations on analysis and advice when appropriate.

The consultant is likely to be called on to present analysis and advice to the ENA Cost of Capital Subgroup.

Conflicts

The consultant is to identify any current or future potential conflicts.

Fees

The consultant is requested to:

- Provide a fixed total cost for the project, and set out hourly rates for the proposed project team should additional work be required.
- Supply details about the staff who will provide the strategic analysis and advice.
- Declare the absence of any relevant conflict of interest in undertaking the project; and
- Indicate preparedness to enter into a confidentiality agreement regarding research and findings.

Any changes to the scope of the consultancy must be agreed with the ENA before the quotation is submitted. Miscellaneous costs such as travel and accommodation will be reimbursed, on the understanding that prior agreement will be sought from the ENA before the costs are incurred.

Contacts

Any questions regarding this terms of reference should be directed to:

Jeremy Rothfield, Jeremy.Rothfield@ue.com.au, 03 8846 9854

Appendix D. Federal Court Guidelines

FEDERAL COURT OF AUSTRALIA
Practice Note CM 7

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

Practice Note CM 7 issued on 1 August 2011 is revoked with effect from midnight on 3 June 2013 and the following Practice Note is substituted.

Commencement

1. This Practice Note commences on 4 June 2013.

Introduction

2. Rule 23.12 of the Federal Court Rules 2011 requires a party to give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).

3. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence[139], and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court[140]

1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.

1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential.

1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

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[139] As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

[140] The "*Ikarian Reefer*" (1993) 20 FSR 563 at 565-566.

2. The Form of the Expert's Report[141]

2.1 An expert's written report must comply with Rule 23.13 and therefore must

(a) be signed by the expert who prepared the report; and

(b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and

(c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and

(d) identify the questions that the expert was asked to address; and

(e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and

(f) set out separately from the factual findings or assumptions each of the expert's opinions; and

(g) set out the reasons for each of the expert's opinions; and

(ga) contain an acknowledgment that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c) above[142]; and

(h) comply with the Practice Note.

2.2 At the end of the report the expert should declare that "[the expert] has *made all the inquiries that* [the expert] *believes are desirable and appropriate and that no matters of significance that* [the expert] *regards as relevant have, to* [the expert's] *knowledge, been withheld from the Court*."

2.3 There should be included in or attached to the report the documents and other materials that the expert has been instructed to consider.

2.4 If, after exchange of reports or at any other stage, an expert witness changes the expert's opinion, having read another expert's report or for any other reason, the change should be communicated as soon as practicable (through the party's lawyers) to each party to whom the expert witness's report has been provided and, when appropriate, to the Court[143].

2.5 If an expert's opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.

2.6 The expert should make it clear if a particular question or issue falls outside the relevant field of expertise.

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[141] Rule 23.13.

[142] See also *Dasreef Pty Limited v Nawaf Hawchar* [2011] HCA 21.

[143] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565

2.7 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports[144].

3. Experts' Conference

3.1 If experts retained by the parties meet at the direction of the Court, it would be improper for an expert to be given, or to accept, instructions not to reach agreement. If, at a meeting directed by the Court, the experts cannot reach agreement about matters of expert opinion, they should specify their reasons for being unable to do so.

J L B ALLSOP
Chief Justice
4 June 2013

[144] The *"Ikarian Reefer"* [1993] 20 FSR 563 at 565-566. See also Ormrod *"Scientific Evidence in Court"* [1968] Crim LR 240

Appendix E. Curricula Vitae

Simon M. Wheatley

5 Maple Street
Blackburn VIC 3130
Tel: +61 3 9878 7985
E-mail: swhe4155@bigpond.net.au

Overview

Simon is a consultant and was until 2008 a Professor of Finance at the University of Melbourne. Since 2008, Simon has applied his finance expertise in investment management and consulting outside the university sector. Simon's interests and expertise are in individual portfolio choice theory, testing asset-pricing models and determining the extent to which returns are predictable. Prior to joining the University of Melbourne, Simon taught finance at the Universities of British Columbia, Chicago, New South Wales, Rochester and Washington.

Personal

Nationalities:	U.K. and U.S.
Permanent residency:	Australia

Employment

- Special Consultant, NERA Economic Consulting, 2009-present
- External Consultant, NERA Economic Consulting, 2008-2009
- Quantitative Analyst, Victorian Funds Management Corporation, 2008-2009
- Adjunct, Melbourne Business School, 2008
- Professor, Department of Finance, University of Melbourne, 2001-2008
- Associate Professor, Department of Finance, University of Melbourne, 1999-2001
- Associate Professor, Australian Graduate School of Management, 1994-1999
- Visiting Assistant Professor, Graduate School of Business, University of Chicago, 1993-1994

- Visiting Assistant Professor, Faculty of Commerce, University of British Columbia, 1986
- Assistant Professor, Graduate School of Business, University of Washington, 1984-1993

Education

- Ph.D., University of Rochester, USA, 1986; Major area: Finance; Minor area: Applied statistics; Thesis topic: Some tests of international equity market integration; Dissertation committee: Charles I. Plosser (chairman), Peter Garber, Clifford W. Smith, Rene M. Stulz
- M.A., Economics, Simon Fraser University, Canada, 1979
- M.A., Economics, Aberdeen University, Scotland, 1977

Publicly Available Reports

The Market, Size and Value Premiums: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%2015%20-%20ENAMRPReport28062013%20Final.pdf

Estimates of the Zero-Beta Premium: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%202%20-%20Black%20CAPM%20Zero%20Beta%20Estimate%20(Final)%20-%2027%20June..pdf

The Payout Ratio: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%2012%20-%20Payout%20Ratio%20(Final)%20-%20June%202013.pdf

Review of Cost of Equity Models: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%201%20-%20Alternative%20Cost%20of%20Equity%20Models%20(Final)%20-%2026%20June.pdf

The Cost of Equity for a Regulated Energy Utility: A Response to the QCA Discussion Paper on the Risk-Free Rate and the MRP: A report for United Energy and Multinet Gas, March 2013, http://www.qca.org.au/files/CI-UEM-SubNERA-CCR1213-0413.pdf

The Cost of Equity for a Regulated Energy Utility: A report for Multinet, February 2013, http://www.erawa.com.au/cproot/11197/2/20130312%20-%20D103642%20-%20Guidelines%20for%20the%20Rate%20of%20Return%20for%20Gas%20Transmission%20and%20Distribution%20Networks%20-%20United%20Energy%20and%20Multinet%20Gas.pdf

The Black CAPM: A report for APA Group, Envestra, Multinet & SP AusNet, March 2012, http://www.aer.gov.au/sites/default/files/Attachment%209.6%20NERA%20-%20Black%20CAPM%20Report%20March%202012.pdf

Prevailing Conditions and the Market Risk Premium: A report for APA Group, Envestra, Multinet & SP AusNet, March 2012, http://www.aer.gov.au/content/item.phtml?itemId=753605&nodeId=418ee68d5b881d58515e4f39d9d3aee3&fn=G-5%20NERA%20%20Prevailing%20Conditions%20and%20the%20Market%20Risk%20Premium%20March%202012.pdf

The Market Risk Premium: A report for CitiPower, Jemena, Powercor, SP AusNet and United Energy, 20 February 2012, http://www.aer.gov.au/content/item.phtml?itemId=752660&nodeId=fe0280e7e2113c467dfc4b3b076e1623&fn=Vic%20DNSPs%20(NERA)%20-%2020%20February%202012.pdf

Cost of Equity in the ERA DBNGP Draft Decision: A report for DBNGP, 17 May 2011, http://www.erawa.com.au/cproot/9669/2/20110620%20-%20DBNGP%20(WA)%20%20-%20Sub%2055%20-%20Att%207%20-%20NERA%20Economic%20Consulting%20Cost%20of%20equity%20in%20the%20draft%20decision.pdf

The Market Risk Premium: A report for Multinet Gas and SP AusNet, 29 April 2011, http://www.aer.gov.au/content/index.phtml/itemId/745782

Cost of Capital for Water Infrastructure Company Report for the Queensland Competition Authority, 28 March 2011, http://www.qca.org.au/files/W-NERA-EconomicConsulting-FinalReport-WACC-0411.pdf

The Cost of Equity: A report for Orion, 2 September 2010, http://www.comcom.govt.nz/assets/Pan-Industry/Input-Methodologies/Draft-Reasons-Papers/Draft-Reasons-EDBs/Draft-Determination-X-Sub/Orion-Cross-Submission-Attachment-on-EDBs-and-GPBs-Input-Methodologies-Draft-Determination-and-Reasons-Paper-NERA-Report-2-September-2010.pdf

New Gamma Issues Raised by AER Expert Consultants: A report for JGN, 17 May 2010, http://www.aer.gov.au/content/item.phtml?itemId=736652&nodeId=dea014515519350384275dccc6b56018&fn=JGN%20further%20submission%20on%20gamma%20(18%20May%202010).pdf

The Required Rate of Return on Equity for a Gas Transmission Pipeline: A Report for DBP, 31 March 2010, http://www.erawa.com.au/cproot/8512/2/20100503%20D29252%20DBNGP%20-%20Submission%208%20-%20Annexure%201%20-%20The%20Required%20Rate%20of%20Return%20on%20Equity%20for%20a%20Gas%20Transmission%20Pipeline.pdf

Jemena Access Arrangement Proposal for the NSW Gas Networks: AER Draft Decision: A report for Jemena, 19 March 2010, http://www.aer.gov.au/content/item.phtml?itemId=735229&nodeId=4dc041cfe6e30a2c2

b91e833cad31191&fn=Appendix%205.1%20-%20NERA%20-%20FAMA%20French%20Report.pdf

Payout Ratio of Regulated Firms: A report for Gilbert + Tobin, 5 January 2010, http://www.aer.gov.au/content/item.phtml?itemId=735236&nodeId=10e87413b13d1da23cd55faf20a6918d&fn=Appendix%206.3D%20-%20NERA%20(4%20Jan%2010,%20ETSA)%20Payout%20ratio%20of%20regulated%20firms.pdf

Review of Da, Guo and Jagannathan Empirical Evidence on the CAPM: A report for Jemena Gas Networks, 21 December 2009, http://www.ipart.nsw.gov.au/files/Submission%20-%20Alternative%20approaches%20to%20the%20determination%20of%20the%20cost%20of%20equity%20-%20Jemena%20-%20Sandra%20Gamble%20-%2022%20December%202009%20-%20APD%20-%20Website.PDF

The Value of Imputation Credits for a Regulated Gas Distribution Business: A report for WA Gas Networks, 18 August 2009, summarized in: http://www.erawa.com.au/cproot/8357/2/20100215%20WAGN%20-%20Proposed%20Revisions%20to%20the%20AA%20for%20the%20WAGN%20Gas%20Distribution%20Systems%20Submission%20-%20Public%20Version.pdf

Cost Of Equity - Fama-French Three-Factor Model Jemena Gas Networks (NSW), 12 August 2009, http://www.aer.gov.au/content/item.phtml?itemId=730699&nodeId=4fcc57398775fe84685434e0b749d76a&fn=Appendix%209.1%20-%20NERA%20-%20Cost%20of%20equity%20-%20Fama-French%20Model.pdf

Estimates of the Cost of Equity: A report for WAGN, 22 April 2009, summarized in: http://www.erawa.com.au/cproot/8357/2/20100215%20WAGN%20-%20Proposed%20Revisions%20to%20the%20AA%20for%20the%20WAGN%20Gas%20Distribution%20Systems%20Submission%20-%20Public%20Version.pdf

AER's Proposed WACC Statement – Gamma: A report for the Joint Industry Associations, 30 January 2009, http://www.aer.gov.au/content/item.phtml?itemId=726698&nodeId=80cf978278d317e99c34ae1878525573&fn=JIA%20Appendix%20Q%20-%20NERA%20-%20AER's%20proposed%20WACC%20statement-Gamma.pdf

The Value of Imputation Credits: A report for the ENA, Grid Australia and APIA, 11 September 2008, http://www.ena.asn.au/udocs/24092008aersub/Appendix%20K%20-%20The%20value%20of%20imputation%20credits%20-%20NERA.pdf

Consulting Experience

NERA, 2008-present

Lumina Foundation, Indianapolis, 2009

Industry Funds Management, 2010

Academic Publications

Imputation credits and equity returns, (with Paul Lajbcygier), 2012, *Economic Record* 88, 476-494.

Do measures of investor sentiment predict returns? (with Robert Neal), 1998, *Journal of Financial and Quantitative Analysis* 33, 523-547.

Adverse selection and bid-ask spreads: Evidence from closed-end funds (with Robert Neal), 1998, *Journal of Financial Markets* 1, 121-149.

Shifts in the interest-rate response to money announcements: What can we say about when they occur? (with V. Vance Roley), 1996, *Journal of Business and Economic Statistics* 14, 135-138.

International investment restrictions and closed-end country fund prices, (with Catherine Bonser-Neal, Greggory Brauer, and Robert Neal), 1990, *Journal of Finance* 45, 523-547 (reprinted in International Capital Markets Volume III, 2003, G. Andrew Karolyi and Rene M. Stulz, editors, Edward Elgar Publishing, Cheltenham, Glos).

A critique of latent variable tests of asset pricing models, 1989, *Journal of Financial Economics* 21, 177-212.

Some tests of international equity market integration, 1988, *Journal of Financial Economics* 21, 177-212 (reprinted in International Capital Markets Volume I, 2003, G. Andrew Karolyi and Rene M. Stulz, editors, Edward Elgar Publishing, Cheltenham, Glos).

Some tests of the consumption-based asset pricing model, 1988, *Journal of Monetary Economics* 22, 193-215.

Working Papers

An evaluation of some alternative models for pricing Australian stocks (with Paul Lajbcygier), 2009.

Intertemporal substitution, small-sample bias, and the behaviour of U.S. household consumption (with Kogulakrishnan Maheswaran and Robert Porter), 2007.

Keeping up with the Joneses, human capital, and the home-equity bias (with En Te Chen), 2003.

Evaluating asset pricing models, 1998.

Time-non-separable preferences or artifact of temporal aggregation? (with Robert Porter), 2002.

Testing asset pricing models with infrequently measured factors, 1989.

Refereeing Experience

Referee for Accounting and Finance, the Australian Journal of Management, Economic Letters, Financial Analysts Journal, Financial Management, Journal of Accounting and Economics, Journal of Business, Journal of Empirical Finance, Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Financial Economics, Journal of Futures Markets, Journal of International Economics, Journal of International Money and Finance, Journal of Money, Credit, and Banking, Journal of Monetary Economics, Management Science, National Science Foundation, Pacific-Basin Finance Journal, and the Review of Financial Studies.

Program Committee for the Western Finance Association in 1989 and 2000.

Teaching Experience

International Finance, Melbourne Business School, 2008

Corporate Finance, International Finance, Investments, University of Melbourne, 1999-2008

Corporate Finance, International Finance, Investments, Australian Graduate School of Management, 1994-1999

Investments, University of Chicago, 1993-1994

Investments, University of British Columbia, 1986

International Finance, Investments, University of Washington, 1984-1993

Investments, Macroeconomics, Statistics, University of Rochester, 1982

Accounting, 1981, Australian Graduate School of Management, 1981

Teaching Awards

MBA Professor of the Quarter, Summer 1991, University of Washington

Computing Skills

User of SAS since 1980. EViews, Excel, EXP, LaTex, Matlab, Powerpoint, Visual Basic. Familiar with the Australian School of Business, Compustat and CRSP databases. Some familiarity with Bloomberg, FactSet and IRESS.

Board Membership

Anglican Funds Committee, Melbourne, 2008-2011

Honours

Elected a member of Beta Gamma Sigma, June 1986.

Fellowships

Earhart Foundation Award, 1982-1983

University of Rochester Fellowship, 1979-1984

Simon Fraser University Fellowship, 1979

Inner London Education Authority Award, 1973-1977

Brendan Quach

Senior Consultant

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Tel: +61 2 8864 6502
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E-mail: brendan.quach@nera.com
Website: www.nera.com

Overview

Brendan Quach has eleven years' experience as an economist, specialising in network economics, and competition policy in Australia, New Zealand and Asia Pacific. Since joining NERA in 2001, Brendan has advised clients on the application of competition policy in Australia, in such industries as aviation, airports, electricity, rail and natural gas. Brendan specialises in regulatory and financial modelling and the cost of capital for network businesses. Prior to joining NERA, Brendan worked at the Australian Chamber of Commerce and Industry, advising on a number of business issues including tax policy, national wage claims and small business reforms.

Qualifications

1991-1995 **AUSTRALIAN NATIONAL UNIVERSITY**
Bachelor of Economics.
(High Second Class Honours)

1991-1997 **AUSTRALIAN NATIONAL UNIVERSITY**
Bachelor of Laws.

Career Details

2001 - **NERA ECONOMIC CONSULTING**
Economist, Sydney

1998-1999 **AUSTRALIAN CHAMBER OF COMMERCE AND INDUSTRY**
Economist, Canberra

1996 **AUSTRALIAN BUREAU OF STATISTICS**
Research Officer, Canberra

Project Experience

Industry Analysis

2011 **Energy Networks Association**
Review of the regulatory frameworks for energy networks
Brendan is currently advising the ENA on the Australian Energy Regulator's (AER's) potential Rule change proposal. Advice currently focuses on a range of issues including the propose-respond framework, expenditure incentives, the cost of capital and the potential role of judicial reviews.

2011 **MSAR Office for the Development of the Energy Sector**
Development of a New Tariff Structure
Brendan is currently leading a team reviewing Macau's current electricity tariffs. This requires NERA to model and analyse long- and short-run marginal costs, sunk costs and generation dispatch. Our work for the Macau Government will be incorporated into the potential development of new tariffs for residential, commercial and casino customers.

2010 **Industry Funds Management/Queensland Investment Corporation**
Due diligence, Port of Brisbane
Brendan was retained to advise on various regulatory and competition matters likely to affect the future financial and business performance of the Port of Brisbane, in the context of its sale by the Queensland government.

2010-2011 **Minter Ellison /UNELCO**
Review of regulatory decision by the Vanuatu regulator
Assisted in the development of an expert report on a range of matters arising from the Vanuatu regulator's decision to reset electricity prices under four concession contracts held by UNELCO. The matters considered included the methodology employed to calculate the new base price, the appropriateness of the rate of return, the decision by the regulator to reset future prices having regard to past gains/losses.

2010 **Gilbert + Tobin/Confidential – Telecommunications**
Incentive Arrangements for Regulated Telecommunications Services
Brendan provided strategic advice to Gilbert + Tobin on possible regulatory arrangements that allow for the efficient delivery of fixed line telecommunications services in the context of the government mandated roll out the National Broadband Network.

2009-10 **EnergyAustralia – NSW Electricity Distribution**
Review of Public Lighting Services
Brendan provided advice to EnergyAustralia during its electricity distribution price review on the provision of public lighting services. Our work provided strategic and regulatory advice to EnergyAustralia during the appeal of the AER's revenue determination for the 2009-2014 period.

2009 **CitiPower/Powercor**
Efficiency carryover mechanisms
Assisted in the development of an expert report submitted to the AER on the consistency of carrying-forward accrued negative amounts arising from the application of the ESC's efficiency carryover mechanism with the National Electricity Law and the National Electricity Rules.

2009 **Prime Infrastructure**
Sale of Dalrymple Bay Coal Terminal (DBCT)
Brendan provided regulatory advice to a number of potential bidders for the assets of DBCT. Advice included an assessment of the rate of return parameters, depreciation, regulatory modelling and the regulatory arrangements in Queensland.

2008-09 **MSAR Office for the Development of the Energy Sector**
Review of Electricity Cost and Tariff Structures
Review of current and projected costs of electricity provision in Macau, including modelling and analysis of marginal costs and sunk cost attribution to various consumer classes. Our work for the Macau Government has incorporated the development of potential tariff structures (specifically rising block tariff structures) and scenarios, including modelling revenue recovery and cross subsidies.

2008 **Singaporean Ministry for Trade and Industry**
Electricity Industry Review
NERA was retained by the Singaporean Ministry for Trade and Industry (MTI) to provide a comprehensive review of the Singaporean electricity market. Brendan was involved in the analysis of the costs and benefits arising from the restructuring and reform of the Singaporean electricity industry since the mid 1990's, the estimated costs and benefits of future security of supply and energy diversification approaches. The project required NERA to undertake quantitative dispatch modelling of the Singaporean electricity market.

2008 **Ministerial Council Energy**
Retailer of Last Resort
Assisted in the development of a joint expert report with Allens Arthur Robinson (AAR) that: reviewed the existing jurisdictional retailer of last resort (RoLR) frameworks; advised the MCE on the development of an appropriate national policy framework for RoLR and developed a suggested base set of proposals for a national RoLR scheme.

2005-06 **Freehills/South Australian Gas Producers, NSW and South Australia**
Gas supply agreement arbitration
Assisted in the development of an economic expert report in the arbitration of the price to apply following review of a major gas supply agreement between the South Australian gas producers and a large retailer in NSW and South Australia.

2005-2006 **Australian Energy Market Commission (AEMC), Australia**
Advised the AEMC on its review of the Electricity Rules relating to transmission revenue determination and pricing, which included providing briefing papers to the Commission on specific issues raised by the review.

2005-2006 **Minter Ellison/ South West Queensland Gas Producers, Queensland**
Gas supply agreement arbitration
Advised Minter Ellison and the Producers in an arbitration of the price to apply following review of a major gas supply agreement between the South West Queensland gas producers and a large industrial customer.

2005 **International Utility, Queensland**
Generator sale, due diligence
Part of the due diligence team acting on behalf of a large international utility in the purchase of two coal fired generators in Queensland, Australia. Provided advice on the features of the Australian electricity market and regulatory environment.

2003 **Auckland City Council, New Zealand**
Rationalisation Options Study
Conducting a rationalisation options study to examine alternative business models for Metrowater. Our report assessed different vertical and horizontal integration options for Metrowater.

2003 **Metrowater, New Zealand**
Institutional Restructuring
Prepared advice for the board of the Auckland City Water and wastewater service provider, Metrowater on options for institutional and regulatory reform of the entire Auckland regional water sector.

2002 - 2003 **Rail Infrastructure Corporation, Australia**
Research to RIC on their proposed access undertaking.
Provided research and advice into various components of RICs proposed access undertaking with the ACCC including the cost of capital, asset valuation and pricing principles.

2002 **Argus Telecommunications, Australia**
Critique of CIE's bandwidth pricing principles.
Provided a critique of a CIE report on bandwidth pricing principles for the fibre optic networked run owned by Argus Telecommunications.

2001 **Screenrights, Australia**
Advice on valuing retransmission of local TV
A review and analysis of different methodologies in valuing retransmission of local television on pay TV services.

Regulatory and Financial Analysis

2012 **Queensland Competition Authority**
Review of the retail water regulatory models
Brendan undertook an independent quality assurance assessment of the financial models relied on by the QCA to set the regulated revenues of SunWater. The review considered: SunWater's Financial model, a model used by SunWater to calculate future electricity prices, an renewals annuity model, as well as the QCA's regulatory model. These models established a set of recommended prices for each of the 30 irrigation schemes operated by SunWater for the period 2014 to 2019.

2011 **Queensland Competition Authority**
Review of the retail water regulatory models
Undertook an independent quality assurance assessment of the models used to calculate regulated revenues for Queensland Urban Utilities, Allconnex Water, and Unitywater. The review considered: the formulation of the WACC; the intra year timing of cashflows; and the structural, computational and economic integrity of the models.

2011 **Queensland Competition Authority**
Review of the wholesale water regulatory models
Undertook an independent quality assurance assessment of the models used to calculate regulated revenues for LinkWater, Seqwater; and

WaterSecure. The review considered: the formulation of the WACC; the intra year timing of cashflows; and the structural, computational and economic integrity of the models.

2011 **Multinet Gas and SP AusNet - Gas Distribution**
Report on the market risk premium
Co-authored a report that examined a number of issues arising from the draft decision on Envestra's access proposal for the SA gas network. The report considered whether: the historical evidence supported the use of a long term average of 6 per cent; there is any evidence to warrant a MRP at it long term average; and the evidence relied on by the AER to justify its return to a MRP of 6 per cent.

2011 **Dampier to Bunbury Natural Gas Pipeline - Gas Transmission**
Cost of Equity
Co-authored two reports that updated the cost of equity for a gas transmission business and responded to issues raised by the regulator in its draft decision. The report re-estimated the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and a zero beta version of the Fama-French three-factor model.

2010-2011 **Queensland Competition Authority**
Weighted Average Cost of Capital (WACC) for SunWater
Retained to provide two expert reports on the WACC for SunWater a Queensland rural infrastructure business. The first report considered issues pertaining to whether a single or multiple rates of return can be applied across SunWater's network segments. The second report focuses market evidence on the appropriate rate of return for SunWater.

2011 **Mallesons Stephens Jaques, on behalf of ActewAGL Distribution**
Determining the averaging period
Assisted in the development of an expert report that considered the economic and financial matters arising from the Australian Energy Regulator's decision to reject ActewAGL's proposed risk free rate averaging period.

2010 **Orion Energy, New Zealand**
Information disclosure regime
Provided advice and assistance in preparing submissions by Orion to the New Zealand Commerce Commission, in relation to the Commission's proposed weighted average cost of capital for an electricity lines businesses. Issues addressed included the financial model used to calculate the required return on equity, the appropriate term for the risk free rate and the WACC parameter values proposed by the Commission.

2010 **Ministerial Council on Energy, Smart Meter Working Group, The costs and benefits of electricity smart metering infrastructure in rural and remote communities**

This report extends NERA's earlier analysis of the costs and benefits of a mandatory roll out of smart meters, by consider the implications of a roll out in rural and remote communities in the Northern Territory, Western Australia and Queensland. The project has focused on eight case study communities and has examined the implications of prepayment metering and remoteness on the overall costs and benefits of a roll out.

2010 **Grid Australia, Submission to the AER on the proposed amendments to the transmission revenue and asset value models**

Developed and drafted a submission to the AER on the proposed amendments to the AER's post-tax revenue model (PTRM) and roll forward model (RFM). The proposal focused on a number of suggestions to simplify and increase the usability of the existing models.

2010 **Dampier to Bunbury Natural Gas Pipeline (DBNGP) - Gas Transmission**

Cost of Equity

Co-authored a report that examined four well accepted financial models to estimate the cost of equity for a gas transmission business. The report of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and a zero beta version of the Fama-French three-factor model.

2009-10 **Jemena - Gas Distribution**

Cost of Equity

Co-authored two reports on the use of the Fama-French three-factor model to estimate the cost of equity for regulated gas distribution business. The report examined whether the Fama-French three-factor model met the dual requirements of the National Gas Code to provide an accurate estimate of the cost of equity and be a well accepted financial model. Using Australian financial data the report also provided a current estimate of the cost of equity for Jemena.

2009 **WA Gas Networks - Gas Distribution**

Cost of Equity

Co-authored a report that examined a range of financial models that could be used to estimate the cost of equity for a gas distribution business. The report of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM, Fama-French three-factor model and Fama-French two-factor model. The report examined both the domestic and international data.

2009 **CitiPower and Powercor – Victorian Electricity Distribution Network Reliability Incentive Mechanism (S-factor)**

Brendan provided advice to CitiPower and Powercor on the proposed changes to the operation of the reliability incentive mechanism. The advice considered the effects of the proposed changes to the operation of the two distribution network service providers. Specifically, how the 'S-factors' would be changed and implications this has to the revenue streams of the two businesses. A comparison was also made with the current ESC arrangements to highlight the changes to the mechanism.

2009 **CitiPower and Powercor – Victorian Electricity Distribution Network Reliability Incentive Mechanism (S-factor)**

Brendan provided advice to CitiPower and Powercor on the proposed changes to the operation of the reliability incentive mechanism. The advice considered the effects of the new arrangements on the business case for undertaking a series of reliability projects. Specifically, the project estimated the net benefit to the businesses of three reliability programs.

2009 **Jemena and ActewAGL - Gas Distribution Cost of Equity**

Co-authored a report on alternative financial models for estimating the cost of equity. The report examined the implication of estimating the cost of equity of a gas distribution business using the Sharpe Lintner CAPM, Black CAPM and Fama-French models. The report examined both the domestic and international data.

2008 **Joint Industry Associations - APIA, ENA and Grid Australia Weighted Average Cost of Capital**

Assisted in the drafting of the Joint Industry Associations submission to the Australian Energy Regulator's weighted average cost of capital review. The submission examined the current market evidence of the cost of capital for Australian regulated electricity transmission and distribution businesses.

2008 **Joint Industry Associations - APIA, ENA and Grid Australia Weighted Average Cost of Capital**

Expert report for the Joint Industry Associations on the value of imputation credits. The expert report was attached to their submission to the Australian Energy Regulator's weighted average cost of capital review. The report examined the current evidence of the market value of imputation credits (gamma) created by Australian regulated electricity transmission and distribution businesses.

2007-2008 **Smart Meter Working Group, Ministerial Council on Energy – Assessment of the costs and benefits of a national mandated rollout of smart metering and direct load control**

Part of a project team that considered the costs and benefits of a national mandated rollout of electricity smart meters. Brendan was primarily responsible for the collection of data and the modelling of the overall costs and benefits of smart metering functions and scenarios. The analysis also considering the likely costs and benefits associated with the likely demand responses from consumers and impacts on vulnerable customers.

2007 **Electricity Transmission Network Owners Forum (ETNOF), Submission to the AER on the proposed transmission revenue and asset value models**

Developed and drafted a submission to the AER on the proposed post-tax revenue model (PTRM) and roll forward model (RFM) that would apply to all electricity transmission network service providers (TNSPs). The proposal focused ensuring that the regulatory models gave effect to the AER's regulatory decisions and insures that TNSPs have a reasonable opportunity to recover their efficient costs.

2007 **Victorian Electricity Distribution Business**
Review of Smart Meter model

Reviewed the smart meter model developed by a Victorian distributor and submitted to the Victorian Essential Service Commission (ESC). The smart meter model supported the business' regulatory proposal that quantified the revenue required to meet the mandated roll out of smart meters in Victoria. The smart meter model the quantified the expected, meter, installation, communications, IT and project management costs associated with the introduction of smart meters. Further, the estimated the expected change in the business' meter reading and other ongoing costs attributed with the introduction of smart meter infrastructure.

2007 **Energy Trade Associations - APIA, ENA and Grid Australia**
Weighted Average Cost of Capital

Expert reports submitted to the Victorian Essential Services Commission evaluating its draft decision to set the equity beta at 0.7, and its methodology for determining the appropriate real risk free rate of interest, for the purpose of determining the allowed rate of return for gas distribution businesses.

2007 **Babcock and Brown Infrastructure, Qld**
Review of Regulatory Modelling

Provided advice to Babcock and Brown Infrastructure on the regulatory modelling of revenues and asset values of the Dalrymple Bay Coal Terminal (DBCT). DBCT has undertaken a substantial

capital investment to increase the capacity of the port. Brendan's role was to advise DBCT on variety of issues including the calculation of interest during construction, appropriate finance charges, cost of capital and regulatory revenues which were submitted to the Queensland Competition Authority (QCA).

2007- **ActewAGL, ACT**
Transition to National Electricity Regulation
Providing on-going advice to ActewAGL, the ACT electricity distribution network service provider, on its move to the national energy regulation. The advice covers the revenue and asset modelling, the development of a tax asset base, the new incentives for efficient operating and capital expenditure and processes for compliance, monitoring and reporting of its regulatory activities.

2007 - 2008 **Smart Meter Working Group, Ministerial Council on Energy – Assessment of the costs and benefits of a national mandated rollout of smart metering and direct load control**
Brendan was a member of NERA team that investigated the costs and benefits of a national mandated rollout of electricity smart meters. Brendan's prime responsibility was to undertake the modelling of the costs and benefits of smart metering. NERA's assignment required an assessment of smart metering functions and scenarios, and also considering the likely demand responses from consumers and impacts on vulnerable customers.

2005- **TransGrid, NSW**
Review of Regulatory Systems
Providing strategic advice to TransGrid, the NSW electricity transmission network service provider, on its current regulatory processes. The advice covers TransGrid's internal systems and processes for compliance, monitoring and reporting of its regulatory activities.

2006 **Grid Australia, National**
Submission to application by Stanwell to change the national Electricity Rules (Replacement and Reconfiguration investments)
Developed and drafted a submission to the AEMC on the appropriateness of the draft Rule change that extended the application of the regulatory test to replacement and reconfiguration investments.

2006 **Grid Australia, National**
Submission to application by MCE to change the national Electricity Rules (Regulatory Test)
Developed and drafted a submission to the AEMC on the appropriateness of the draft Rule change which changed the

Regulatory Test as it applies to investments made under the market benefits limb.

2006 **Office of the Tasmanian Energy Regulator**
Implications of the pre-tax or post-tax WACC
Provided a report to OTTER on the potential implications of changing from a pre-tax to a post-tax regulatory framework.

2006 **Babcock Brown Infrastructure**
Regulatory Modelling of Dalrymple Bay Coal Terminal
Developed the economic model used to determine revenues at Dalrymple Bay Coal Terminal. This included updating the model for capital expenditure to upgrade capacity at the terminal, account for intra-year cash flows, and the proper formulation of the weighted average cost of capital and inflation.

2006 **Queensland Competition Authority, Queensland**
Review of Regulatory Revenue Models
Advised the QCA on the financial and economic logic of its revenue building block model that projects the required revenue for the Queensland gas distribution businesses and tariffs for the next 5 years.

2006 **Envestra, South Australia**
Review of RAB Roll Forward Approach
Assisted Envestra in responding to the Essential Services Commission of South Australia's consultation paper on Envestra's 2006/07 to 2010/11 gas access proposal. This involved reviewing Envestra's RAB roll forward modelling and the Allen Consulting Group's critique thereof.

2006 **Transpower, New Zealand**
Review of Regulatory Systems
Provided assistance to Transpower, the sole electricity company in New Zealand, in responding to the New Zealand Commerce Commission's announcement of its intention to declare control of Transpower. This involved developing an expert report commenting on the Commission's methodology for analysing whether Transpower's has earned excess profits in the context of New Zealand's "threshold and control" regime.

2006 **Pacific National**
Rail industry structure and efficiency
Assisted with the development of a report which examined options for addressing issues arising in vertically-separated rail industries. This involved examining a number of case study countries including the UK, US and Canada.

2005 **Australian Energy Markets Commission, Australia**
Transmission pricing regime
Advisor to the AEMC's review of the transmission revenue and pricing rules as required by the new National Electricity Law.

2005 **Queensland Rail, Australia**
Weighted Average Cost of Capital
Provided a report for Queensland Rail on the appropriate weighted average cost of capital for its regulated below rail activities.

2004-2005 **ETSA Utilities**
Review of Regulatory Modelling
Advised ETSA Utilities on the financial and economic logic of ESCOSA's regulatory models used to determine the regulatory asset base, the weighted average cost of capital, regulatory revenues and distribution prices.

2003- 2005 **TransGrid, NSW**
Review of Regulatory Revenues
Assisted TransGrid in relation to its application to the ACCC for the forthcoming regulatory review which focused on asset valuation and roll forward, cost of capital and financial/regulatory modelling.

2004 **Prime Infrastructure, Australia**
Weighted Average Cost of Capital
Provided a report for Prime Infrastructure on the appropriate weighted average cost of capital for its regulated activities (coal shipping terminal).

2004 **PowerGas, Singapore**
Review of Transmission Tariff Model
Advised the Singaporean gas transmission network owner on the financial and economic logic of its revenue building block model that projects PowerGas' revenue requirements and tariffs for the next 5 years.

2003 **ActewAGL, ACT**
Review of Regulatory Revenues
Provided strategic advice to ActewAGL in developing cost of capital principles, asset valuation and incentive mechanisms as part of their current pricing reviews for their electricity and water businesses.

2003 **Orion Energy, New Zealand**
Threshold and Control Regime in the Electricity Sector
Provided advice and assistance in preparing submissions by Orion to the Commerce Commission, in relation to the Commission's proposed

changes to the regulatory regime for electricity lines businesses. Issues addressed included asset valuation, and the form of regulatory control.

2003 **EnergyAustralia, NSW**
Pricing Strategy Under a Price Cap
Advised EnergyAustralia on IPART's financial modelling of both regulated revenues and the weighted average price cap.

2002-03 **TransGrid, NSW,**
Advice in Relation to the Regulatory Test
Modelled the net present value of a range of investment options aimed at addressing a potential reliability issue in the Western Area of New South Wales. This work was undertaken in the context of the application of the ACCC's "regulatory test" which is intended to ensure only *efficient* investment projects are included in the regulatory asset base.

2002 **Rail Infrastructure Corporation (RIC), Australia**
Review of the Cost of Capital Model
Provided advice to RIC and assisted in drafting RIC's submission to the Australian Competition and Consumer Commission (ACCC) on the appropriate cost of capital. This included building a post-tax revenue model of RIC's revenues in the regulatory period.

2002 **PowerGrid, Singapore**
Review of Transmission Tariff Model
Advised the Singaporean electricity transmission network owner on the financial and economic logic of its revenue building block model that projects PowerGrid's revenue requirements and tariffs for the next 10 years.

2002 **EnergyAustralia, Australia**
Review of IPART's Distribution Tariff Model
Advised EnergyAustralia, a NSW distribution service provider, on the economic logic of the revenue model that projects EnergyAustralia's revenue requirements and tariffs for the 2004-2009 regulatory period.

2002 **Essential Services Commission of South Australia**
Review Model to Estimating Energy Costs
Reviewed and critiqued a model for estimating retail electricity costs for retail customers in South Australia for 2002-2003.

2002 **National Competition Council (NCC), Australia**
Exploitation of Market Power by a Gas Pipeline
Provided a report to the NCC in which we developed a number of tests for whether current transmission prices were evidence of the

exploitation of market power by a gas transmission pipeline. Also provided a separate report that applied each of the tests developed. This analysis was relied on by the NCC in determining whether to recommend the pipeline in question be subject to regulation under the Australian Gas Code.

2002 **Australian Gas and Lighting, Australia**
Report on South Australian Retail Tariffs
An independent assessment on the cost components of regulated retail tariffs in South Australia that will be used by AGL in the next review.

2002 **New Zealand Telecom, New Zealand**
Report on the application of wholesale benchmarks in NZ
A report on the application of international benchmarks of wholesale discounts to New Zealand Telecom.

2002 **ENEL, Italy**
Survey of Retailer of Last Resort in NSW
Provided research into the retailer of last resort provisions in the NSW gas sector of an international review for the Italian incumbent utility.

2002 **ENEL, Italy**
Survey of Quality of Service provisions in Victoria and South Australia
Provided research into quality of service regulation for electricity distribution businesses in Victoria and South Australia of an international review for the Italian incumbent utility.

2002 **Integral Energy, Australia**
Provided Advice on the Cost of Capital for the 2004 – 2008 Distribution Network Review
Provided analysis and strategic advice to Integral Energy on the possible methodologies that IPART may use to calculate the cost of capital in the next regulatory period.

2001 **IPART, Australia**
Minimum Standards in Regulation of Gas and Electricity Distribution
Advised the NSW regulator on the appropriate role of minimum standards in regulatory regimes and how this could be practically implemented in NSW.

2001 **TransGrid, Australia**
Advice on ACCC's Powerlink WACC decision
Provided a report critically appraising the ACCC's decision regarding Powerlink's weighted average cost of capital (WACC).

Competition Policy

2005 **Confidential, Australia**
Merger Analysis
Provided expert opinion as well as strategic guidance to the merging firms on the competitive implications of that merger.

2004 **Mallesons Stephen Jaques / Sydney Airports Corporation, Australia**
Appeal to declare under Part IIIA
Provided strategic and economic advice on aspects of Virgin Blue's appeal for the declaration of airside facilities at Sydney Airport under Part IIIA of the Trade Practices Act. This cumulated in the production of an expert witness statement by Gregory Houston.

2003 **Sydney Airports Corporation, Australia**
Application to declare under Part IIIA
Expert report to the National Competition Council in connection with the application by Virgin Blue to declare airside facilities at Sydney Airport under Part IIIA of the Trade Practices Act, and the potential impact on competition in the market for air travel to and from Sydney.

2002 - 2003 **Blake Dawson Waldron/ Qantas Airways, Australia**
Alleged predatory conduct
NERA was commissioned to provide advice in relation to potential allegations of anticompetitive behaviour. Developed a paper examining the economic theory behind predation and the way courts in various jurisdictions determine whether a firm has breached competition law.

2002 **Phillips Fox and AWB Limited**
Declaration of the Victorian Intra-State Rail Network
Advised law firm Phillips Fox (and AWB Limited) in its preparation for an appeal (in the Australian Competition Tribunal) of the Minister's decision not to declare the Victorian intra-state rail network, pursuant to Part IIIA of the Trade Practices Act. This included assisting in the preparation of testimony relating to pricing arrangements for third party access to the rail network and their likely impact on competition in related markets, including the bulk freight transportation services market.

2002 **Singapore Power International (SPI)**
Impact of acquisition of a Victorian distributor on competition
Provided analysis to a company interested in acquiring CitiPower (a Victorian electricity distribution/retail business). Including an assessment of the extent to which the acquisition of CitiPower would

lead to a 'substantial lessening of competition' in a relevant energy markets, given the company's existing Australian electricity sector assets. The NERA report was submitted to the ACCC as part of the pre-bid acquisition clearance process.

Other

1999-2000 **Australian Chamber of Commerce and Industry, Australia**
Alienation of Personal Service Income
Involved in analysing the effects of the proposed business tax reform package had on a number of industries which advocated a number of recommendations to the Federal Government. The package also included the provisions to change the definition of personal service income.

1998-2000 **Australian Chamber of Commerce and Industry, Australia**
Various economic policy issues
Provided analysis on economic trends and Government policies to business groups. This covered issues such as industrial relations reform, taxation changes, business initiatives, and fiscal and monetary settings. Also compiled ACCI surveys on business conditions and expectations.

1996 **Australian Bureau of Statistics, Australia**
Productivity Measures in the Public Health Sector
Involved in a team that reported on the current methods used to measure output in the public health sector and analysed alternative methods used internationally. This was in response to the ABS investigating the inclusion of productivity changes in the public health sector.

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