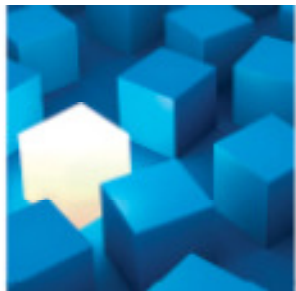# Attachment M.15

Attachment M15_NERA: Further Assessment of the Historical MRP: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors

June, 2015

SA Power Networks

NERA
ECONOMIC CONSULTING

Further Assessment of the Historical *MRP*: Response to the AER's Final Decisions for the NSW and ACT Electricity Distributors

A report for ActewAGL Distribution, AGN, APA, AusNet Services, CitiPower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks and United Energy

June 2015

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Executive Summary

This report has been prepared for ActewAGL Distribution, AGN, APA, AusNet Services, CitiPower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks and United Energy (the networks) by NERA Economic Consulting (NERA). The networks have asked NERA to provide updated estimates of the market risk premium (*MRP*) and to respond to issues raised by the AER in its recently published *Final decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20* and by the advisors to the AER.

 In particular, the networks have asked NERA to:

- provide updated estimates of the *MRP*;

- examine the sensitivity of these estimates to changes in our database;

- examine whether it is possible to come closer to reproducing the yields that Lamberton (1961) provides; [1] and

- respond to issues raised by the AER and its advisors in recent decisions and reports.

Estimates of the *MRP*

We update our estimates of the *MRP* to the end of 2014 and make a number of changes to our data. The net impact of adding another year of data and of making a number of changes to our data is to lower our estimate of the *MRP* by one basis point to 6.55 per cent per annum from the estimate that we provide in February 2015 of 6.56 per cent per annum based on data from 1883 to 2013. Our new estimate uses data from 1883 to 2014 and, like our old estimate, an assumption that the market places a value of 35 cents on a dollar of imputation credits distributed. [2] The standard error attached to the estimate is 1.44 per cent per annum.

Sensitivity of *MRP* estimates

Our data, like the data that the AER uses, employs a series of yields that Lamberton (1961) provides. [3] Brailsford, Handley and Maheswaran (2008) suggest that the series that Lamberton provides overstates the yield on the Commercial and Industrial/All Ordinaries price series that Lamberton (1958) also supplies. [4] The evidence that we provide in our June 2013 and October 2013 reports suggests that some adjustment should be made to Lamberton's yield data but that the adjustment should be smaller than the adjustment that

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

[2]　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] ACompT9, May 2011.

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

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

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

Brailsford, Handley and Maheswaran believe to be appropriate. [5] Here, we examine the issue further. In particular, we make a number of changes to examine the sensitivity of our estimates of the *MRP* to the data that we use. We find that only two of the changes affect an estimate of the *MRP* computed over the period 1883 to 2014 by more than one half of a basis point.

The first of these changes is the use of yield data for December 1883 in addition to the use of the yield data for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941 and December 1951 that we employ in our June 2013 and October 2013 submissions. [6] The quarter ending in December 1883 is the first quarter for which yield data are available from TJ Thompson and Sons' monthly *Stock and Share Reports*, the source for dividend data on which Lamberton relies in the early part of his sample. We use yield data for December 1883 so as to effectively eliminate the requirement for extrapolation through periods in the past. The impact of this change is to raise our estimate of the *MRP* over the period 1883 to 2014 by around three basis points. In other words, the impact is small.

Lamberton (1958) states about the price data that he uses from 1875 to 1936 that: [7]

> 'Price data were drawn from the following sources: *Sydney Morning Herald* financial pages, January 1875-September 1882; TJ Thompson and Sons' monthly *Stock and Share Reports*, October 1882-December 1903; Sydney Stock Exchange official sales records, January 1904-June 1936.'

> 'Monthly low and high prices were recorded for all shares traded and this list constituted the population for sampling purposes.'

Lamberton (1958) states about the price data that he uses from 1936 to 1957 that: [8]

> 'The price data used in the calculation of the new indices were drawn from the official sales records of the Sydney Stock Exchange. The means of the high and low prices were taken as the average price for each calendar month.'

Using only the sources indicated for the earlier years leaves quite a lot of missing data. For example, in 1891 three of the nine share issues that Lamberton uses to construct his commercial and industrial index have missing data. In 1901, four of the 12 share issues that Lamberton uses to construct his commercial and industrial index have missing data. We find it difficult to believe that Lamberton does not use, for the earlier years, additional sources to

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

    NERA, *The market risk premium: Analysis in response to the AER's Draft Rate of Return Guidelines*, October 2013.

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

    NERA, *The market risk premium: Analysis in response to the AER's Draft Rate of Return Guidelines*, October 2013.

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

[8]   Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, page 48.

supplement the data drawn from the price sources that he indicates that he uses. In addition, we have access to the Sydney Stock Exchange (SSE) *Monthly Stock and Share List* but not to the official sales records of the exchange. For these two reasons, we have in past submissions used, rather than averages of high and low prices drawn from the price sources indicated by Lamberton, averages of end-of-quarter or close-to-end-of-quarter buy and sell prices drawn, almost exclusively, from the sources that Lamberton uses to extract not only prices but also other financial data.

The second change that leads to a more than one half basis point change in our estimate of the *MRP* is the use of high and low prices from the *Sydney Morning Herald*, TJ Thompson and Sons' monthly *Stock and Share Reports* and data from the SSE *Monthly Stock and Share List* in place of the end-of-quarter buy and sell prices we previously employed. The impact of this change is to lower our estimate of the *MRP* over the period 1883 to 2014 by around two basis points. In other words, the impact is also small.

Reproducing Lamberton's Yields

Handley (2015) and the AER (2015) suggest that the adjustments that we make to Lamberton's data are unreliable because of small differences between an equally weighted yield series that we construct and the equally weighted yield series that Lamberton (1961) provides.[9] We emphasise in our February 2014 report that we do not use the equally weighted yields that we compute to construct an estimate of the *MRP*.[10] We use instead the value-weighted yields that we compute that employ only those stocks that Lamberton uses to produce his price index. We compute equally weighted yields solely so that we can examine how closely we can come to recreating Lamberton's yields, which are also equally weighted, for the quarters that we examine. Here we examine the impact of interpreting a reference made by the SSE *Official Gazette* to 'all ordinary shares' as not to the shares that Lamberton uses to construct his price indices, but instead to all shares irrespective of whether they play a role in constructing a series of prices.[11] When we use all shares irrespective of whether they play a role in constructing Lamberton's price series we are better able to reproduce Lamberton's yields. The correlation between our estimate of the equally weighted average yield to dividend paying issues (firms) and Lamberton's estimate is 1.00 (0.98) (rounded to two decimal places) across the seven years that we examine. The mean of our seven estimates of the equally weighted average yield to dividend paying issues (firms) is 7.43 (7.38) per cent per annum while the mean of his seven estimates is 7.38 per cent per annum.

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[9]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 340.

  Handley, *Further advice on the return on equity*, April 2015, pages 8-9.

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

[10]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, page 35.

[11]   The list of companies that Lamberton uses to construct his price series from 1875 to 1936 are provided in the SSE *Official Gazette* of 14 August 1958.

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

Arithmetic Versus Geometric Averaging

In March 2012 and June 2013 reports we emphasise that an estimate of the long-run weighted average cost of capital (*WACC*) that is based on the arithmetic mean of a sample of annual excess returns to the market portfolio will – so long as the other components of the *WACC* have been correctly computed and ignoring minor adjustments to the regulatory asset base (*RAB*) and to the evolution of prices – produce an unbiased estimate of the revenue that the market will require in any one year, in the long run, on the *RAB*.[12] We also emphasise in the reports that, 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 excess returns to the market portfolio will produce a downwardly biased estimate of the revenue that the market requires in any one year.

While an estimate of the *WACC* compounded over more than one year, based on the arithmetic mean of a sample of annual excess returns to the market portfolio, will be biased, the AER, aside from some minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, never compounds the *WACC* over more than one year.[13] Thus we recommend that for long-run estimates of the *MRP* the AER should rely solely on estimates that use arithmetic means and that the AER should place no weight on estimates that use geometric means. An estimate of the *MRP* that relies solely on estimates that use arithmetic means will provide a materially better estimate than an estimate that relies either fully or in part on geometric means.

We note that in independent advice provided at the request of the Queensland Competition Authority in July 2012, Associate Professor Lally, an advisor to the AER, reaches the same conclusion as we do and states that:[14]

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

> 'If historical average returns are used, they should be arithmetic rather than geometric averages.'

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[12]   NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

　　　NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 25-30.

[13]   Our March 2012 report details the minor adjustments that the AER makes that involve compounding. These have to do with the timing of capital expenditure, difference between actual and forecast capital expenditure and the smoothing of prices.

　　　NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 7-9.

[14]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

The AER continues to ignore the advice that Lally provides in July 2012 and the advice that we provide in March 2012 and June 2013 and instead relies on advice provided by McKenzie and Partington in December 2011 and February 2012 and Partington and Satchell in May 2015. [15] McKenzie and Partington and Partington and Satchell note that an estimate of the *WACC*, compounded over more than one year, that is based on the arithmetic mean of a sample of annual excess returns to the market portfolio will be biased. McKenzie and Partington and Partington and Satchell, however, do not point to where in the regulatory process they believe the AER compounds an estimate of the *WACC*. Again, apart from minor adjustments to the *RAB* and to the evolution of prices, the AER never compounds an estimate of the *WACC*.

Partington and Satchell claim, in their May 2015 report, that whether an arithmetic mean or a geometric mean or some combination of the two will represent a better measure of the expected return to equity will depend on the distribution of returns through time and, in particular, whether returns are identically and independently distributed through time. [16] Partington and Satchell do not state whether they are referring to the expected return to equity measured over one year or over many years. So it is left to the reader to determine whether the results that they cite are in any way relevant to the task of estimating the expected return to equity over one year – which, as we emphasise and Lally (2012) emphasises, is the task that the AER must tackle. [17]

When returns are serially correlated, the information in past excess returns can be used to better forecast future excess returns. Similarly, when the volatility of excess returns varies through time, this information can be used to form better forecasts of future excess returns. We know of no academic work, however, and the AER and Partington and Satchell do not refer to any academic work, that suggests that a geometric mean, that has not been compounded, provides a better estimate of the mean return to equity over a single year than does an arithmetic mean, that has not been compounded, when returns are not identically and independently distributed through time. Similarly, we know of no academic work, and the AER and Partington and Satchell do not refer to any academic work, that suggests that a

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[15]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

   McKenzie, M. and G. Partington, *Report to Corrs Chambers Westgarth: Equity market risk premium*, 21 December 2011, pages 10-12.

   McKenzie, M. and G. Partington, *Report to the AER: Supplementary report on the equity market risk premium*, SIRCA Limited, 22 February 2012, pages 5-9.

   NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

   NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 25-30.

   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, pages 16-17.

[16]   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

[17]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

combination of an arithmetic mean, that has not been compounded, and a geometric mean, that has not been compounded, provides a better estimate of the mean return to equity over a single year than does an arithmetic mean, that has not been compounded, when returns are not identically and independently distributed through time. [18]

Standard Errors

As Goetzmann and Ibbotson (2007) emphasise: [19]

> 'One of the major issues with statistical estimation of the realized equity risk premium is that a very long time series of stationary returns is required to achieve a high degree of confidence in the estimate. The longer the data series, the more accurate the equity risk premium calculation, as long as the fundamental expectations have remained the same.'

Thus we recommend that the AER use the longest time series available. In other words, we recommend that the AER use the entire time series that we provide from 1883 to 2014.

The AER in presenting estimates of the *MRP* provides estimates using both arithmetic means and geometric means over five overlapping periods – all of which include the period 1988 to 2014. [20] As we make clear, no weight should be placed on estimates that use geometric means. Besides this problem, however, the use of overlapping data amounts to placing more weight on estimates that use data from 1988 to 2014 than estimates that use earlier periods. While this may appear a sensible strategy, the impact will be to reduce the precision of the estimates. [21] As things stand, however, this cannot be seen from the AER's presentation of the results because the AER provides no standard errors. We recommend that the AER remove the column of geometric means from its table of results and replace the geometric means with a column of standard errors. This at least will show how imprecise are estimates that rely on a short time series of data. Even this change, however, will do nothing to stop the reader from treating the five overlapping periods as though they were independent – which, of course, they are not. So better still would be for the AER to report an estimate of the *MRP* that uses all of the data and, in addition, estimates that use non-overlapping sub-periods.

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[18]   In our February 2015 report we note that the geometric mean can be used as an input in computing a better estimate of the arithmetic mean when the volatility of excess returns varies through time.

[19]   Goetzmann, W.N. and R.G. Ibbotson, *The equity premium over the very long run*, in Handbook of the equity premium, ed. R. Mehra, Elsevier Science, 2007, Chapter 12.

[20]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 331.

[21]   See section 5 of our June 2013 report.

    NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 31-38.

1.   Introduction

This report has been prepared for ActewAGL Distribution, AGN, APA, AusNet Services, CitiPower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks and United Energy (the networks) by NERA Economic Consulting (NERA). The networks have asked NERA to provide updated estimates of the market risk premium (*MRP*) and to respond to issues raised by the AER in its recently published *Final decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20* and by the advisors to the AER.

 In particular, the networks have asked NERA to:

- provide updated estimates of the *MRP*;

- examine the sensitivity of these estimates to changes in our database;

- examine whether it is possible to come closer to reproducing the yields that Lamberton (1961) provides; [22] and

- respond to issues raised by the AER and its advisors in recent decisions and reports.

The remainder of this report is structured as follows:

- section 2 provides updated estimates of the *MRP*, examines the sensitivity of these estimates to a number of changes to NERA's database and provides estimates of the Australian *MRP* that use both Australian and US data; and

- section 3 responds to issues raised by the AER and its advisors in recent decisions and reports;

In addition:

- Appendix A describes some of our data sources;

- Appendix B provides the terms of reference for this report;

- Appendix C provides a copy of the Federal Court of Australia's Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia; and

- Appendix D provides the curriculum vitae of the author of the report.

Statement of Credentials

This report has been prepared by **Simon Wheatley**.

Simon Wheatley is an Affiliated Industry Expert 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

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

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.

In preparing this report, the author (herein after referred to as 'I' or 'my' or 'me') confirms that I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge, been withheld from this report. I acknowledge that I 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*. I 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 my report has been prepared in accordance with those guidelines.

I have undertaken consultancy assignments for the networks in the past. However, I remain at arm's length, and as an independent consultant.

2.　　　Historical Estimates of the *MRP*

The AER, in its *Final decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, provides estimates of the *MRP* computed using data that Brailsford, Handley and Maheswaran (2012) supply and that the AER updates. [23]　The AER reports that an estimate of the *MRP* from 1883 to 2014 based on an arithmetic mean and the data is 6.2 per cent per annum under the assumption that a one dollar imputation credit distributed is worth 60 cents. In contrast, Dimson, Marsh and Staunton (2015) report that an estimate of the *MRP* from 1900 to 2014 based on an arithmetic mean and an alternative set of data is 6.8 per cent per annum under the assumption that the market places no value on imputation credits distributed. [24]

The difference between the two estimates is in large part 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. [25]　Dimson, Marsh and Staunton (2015) use a series of dividend yields provided to them by Professor Robert Officer of the University of Melbourne that is largely based on a series produced by Lamberton (1961). [26]　Donald Lamberton (later a Professor of Economics at the University of Queensland) worked in the Research and Statistical Bureau of the Sydney Stock Exchange (SSE) from 1949 to 1953. [27]　Brailsford, Handley and Maheswaran (2012) use a series of yields reportedly provided to them by an employee of the Australian Stock Exchange (ASX) with the yield series also largely based on Lamberton's data. [28]　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.　These deficiencies are that Lamberton's yields are equally weighted, use only stocks that pay dividends and use more stocks than do the price indices which were also constructed by Lamberton (1958) for the SSE. [29]　The SSE price indices are employed by both Brailsford, Handley and Maheswaran

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[23]　AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, page 331.

　　　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 2014*, Credit Suisse, February 2015, page 61.

[25]　Other factors affecting the difference are the different time periods that the AER and Dimson, Marsh and Staunton use, differences in the way that Brailsford, Handley and Maheswaran and Dimson, Marsh and Staunton compute bond returns and a difference in the assumption made about the value placed by the market on imputation credits distributed.

[26]　Dimson, E., P. Marsh and M. Staunton, *Credit Suisse Global investment returns sourcebook 2014*, Credit Suisse, February 2015.

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

[27]　Lodewijks, J., *Professor of foresight: An Interview with Donald Lamberton*, Journal of Economic and Social Policy, 2007.

[28]　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.

[29]　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.

and Dimson, Marsh and Staunton for years prior to 1958. [30] The yields that Dimson, Marsh and Staunton use have not been adjusted.

In June 2013 and October 2013 submissions to the AER on behalf of the ENA, NERA assesses whether the adjustment to Lamberton's (1961) yield series over the period 1883 to 1957 in the data that Brailsford, Handley and Maheswaran (2012) employ is fully warranted and provide evidence that it is not. [31] Our evidence suggests that some adjustment should be made to Lamberton's data but that the adjustment should be smaller than the adjustment made to the data with which Brailsford, Handley and Maheswaran were provided. The estimates of the downward bias in our 2013 reports rely on Lamberton's series, Brailsford, Handley and Maheswaran's (2008) 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. [32]

Here we update our estimates of the *MRP* to the end of 2014 and make a number of changes to our data. First, we update our data in the same way as described in our February 2015 report and we find that an estimate of the *MRP* computed using data from 1883 to 2014 is 6.54 per cent per annum – two basis points lower than the estimate that we provided in February 2015 using data from 1883 to 2013. The standard error attached to this estimate is 1.44 per cent per annum and is to all intents and purposes unaffected by the changes that we make. The estimate is computed under the assumption that the market places a value of 35 cents on a dollar of imputation credits distributed. [33] Appendix A describes the sources that we use to update the data. Second, we make a number of changes to our data. The net impact of these adjustments is to raise our estimate of the *MRP* by one basis point to 6.55 per cent per annum.

Handley (2015) and the AER (2015) suggest that the adjustments that we make to Lamberton's data are unreliable because of small differences between an equally weighted yield series that we construct and the equally weighted yield series that Lamberton (1961) provides. [34] We emphasise in our February 2014 report that we do not use the equally

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[30]   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.

[31]   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.

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

    NERA, *The market risk premium: Analysis in response to the AER's Draft Rate of Return Guidelines*, October 2013.

[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.

[33]   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] ACompT9, May 2011.

[34]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 340.

    Handley, *Further advice on the return on equity*, April 2015, pages 8-9.

weighted yields that we compute to construct an estimate of the *MRP*.[35] We use instead the value-weighted yields that we compute that employ only those stocks that Lamberton uses to produce his price index. We compute equally weighted yields solely so that we can examine how closely we can come to recreating Lamberton's yields, which are also equally weighted, for the quarters that we examine. Here we examine the impact of interpreting a reference made by the SSE *Official Gazette* to 'all ordinary shares' as not to the shares that Lamberton uses to construct his price indices, but instead to all shares irrespective of whether they play a role in constructing a series of prices.[36] Using all shares irrespective of whether they play a role in constructing a series of prices we are better able to match the series that Lamberton provides but, again, we emphasise that we do not use the equally weighted yields that we compute to construct an estimate of the *MRP*.

2.1.   Adjustments to Our Data

We make a number of changes to our data and show the impact of making each change in Table 2.1 below. The column labelled 'Existing data' shows estimates of the value-weighted yield, computed using firms employed in constructing the price series that Brailsford, Handley and Maheswaran (2012) use, that we report in our June 2013 and October 2013 submissions, for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941 and December 1951.[37] The row labelled 'Impact' shows the impact in basis points on an estimate of the *MRP* of using these value-weighted yields to construct a series of adjustment factors for use with Lamberton's (1961) yield series rather than the adjustment factor of 0.75 employed by Brailsford, Handley and Maheswaran.[38] Using data from 1883 to 2014, the use of the value-weighted yields that appear in the column labelled 'Existing data' to construct a series of adjustment factors for use with Lamberton's yield series, rather than the adjustment factor of 0.75 employed by Brailsford, Handley and Maheswaran, raises an estimate of the *MRP* by 35.88 basis points.

The first change to our data that we make is to insert an observation for Peters' (an ice-cream maker) new issue that we was omitted from our 1931 database and to exclude preference shares that had been included in our 1941 and 1951 database when calculating adjustment

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

[35]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, page 35.

[36]   The list of companies that Lamberton uses to construct his price series from 1875 to 1936 are provided in the SSE *Official Gazette* of 14 August 1958.

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

[37]   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.

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

NERA, *The market risk premium: Analysis in response to the AER's Draft Rate of Return Guidelines*, October 2013.

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

factors to be used with Lamberton's (1961) yield data. [39] Since we use Lamberton's All Ordinaries index from 1936 to 1957, it should not contain preference shares. The net impact of these two changes, shown in the column labelled 'Without preference shares', is to reduce our estimate of the *MRP* over the period 1883 to 2014 by 35.88 – 35.72 = 0.16 basis points (about one sixth of one basis point) – in other words, the impact is negligible.

The second change that we make is to analyse yield data for December 1883 in addition to yield data for December 1891, December 1901, December 1911, December 1921, December 1931, December 1941 and December 1951. The quarter ending in December 1883 is the first quarter for which yield data are available from TJ Thompson and Sons' monthly *Stock and Share Reports*, the source for dividend data on which Lamberton relies in the early part of his sample. We use yield data for December 1883 so as to all but remove the need for extrapolation. The impact of this change, shown in the column labelled 'With 1883 data', is to raise our estimate of the *MRP* over the period 1883 to 2014 by 38.86 – 35.72 = 3.14 basis points. In other words, the impact is small.

Lamberton (1958) states about the price data that he uses from 1875 to 1936 that: [40]

> 'Price data were drawn from the following sources: *Sydney Morning Herald* financial pages, January 1875-September 1882; TJ Thompson and Sons' monthly *Stock and Share Reports*, October 1882-December 1903; Sydney Stock Exchange official sales records, January 1904-June 1936.'

> 'Monthly low and high prices were recorded for all shares traded and this list constituted the population for sampling purposes.'

Lamberton (1958) states about the price data that he uses from 1936 to 1957 that: [41]

> 'The price data used in the calculation of the new indices were drawn from the official sales records of the Sydney Stock Exchange. The means of the high and low prices were taken as the average price for each calendar month.'

Using only the sources indicated for the earlier years leaves quite a lot of missing data. For example, in 1891 three of the nine issues that Lamberton (1958) uses to construct his commercial and industrial index have missing data. [42,43] In 1901, four of the 12 issues that Lamberton uses to construct his commercial and industrial index have missing data. We find it difficult to believe that Lamberton does not use, for the earlier years, additional sources to

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

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

[41] Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, page 48.

[42] Lamberton, D., *Some statistics of security prices and yields in the Sydney market, 1875-1955*, Economic Record, pages 253-259.

[43] The list of companies that Lamberton uses to construct his price series from 1875 to 1936 are provided in the SSE *Official Gazette* of 14 August 1958.

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

supplement the data drawn from the price sources that he indicates that he uses. In addition, we have access to the SSE *Monthly Stock and Share List* but not to the official sales records of the exchange that Lamberton (1958) uses in later years. [44, 45] For these two reasons, we have in past submissions used, rather than averages of high and low prices drawn from the price sources indicated by Lamberton, averages of end-of-quarter or close-to-end-of-quarter buy and sell prices drawn, almost exclusively, from the sources that Lamberton uses to extract not only prices but also other financial data.

The third change that we make is to use averages of high and low prices listed in the SSE *Monthly Stock and Share List* and other sources instead of end-of- quarter buy and sell prices. For December 1883, December 1891 and December 1901, we use, like Lamberton (1958), the averages of the highs and lows extracted from TJ Thompson and Sons' monthly *Stock and Share Reports.* [46] The January 1912 edition of the *Stock and Share Reports* (which carries data for December 1911) is missing from the State Library of New South Wales – the only institution that the National Library indicates holds the reports – and so for December 1911 we extract high and low prices from sales records provided by the *Sydney Morning Herald* for each day of the month. [47] For 1921 and 1931 we take the high and low prices up until the data of publication – midway through December – for each stock from the SSE *Monthly Stock and Share List.* The 1941 and 1951 editions of the SSE *Monthly Stock and Share List* carry the highs and lows for the previous two years but not for the previous month. So for these two years we use data from the *Sydney Morning Herald* to compute the highs and lows for the five largest firms by market capitalisation as of the start of December 1941 and use these data to adjust the data for the other stocks. We adjust the data by multiplying the yield of each stock, constructed using end-of-month buy and sell prices, by the ratio of the yield on a portfolio of the five largest stocks, constructed using averages of high and low prices, to the yield of the portfolio constructed using end-of-month buy and sell prices.

The impact of this change, shown in the column labelled 'SSE highs and lows', is to raise our estimate of the *MRP* over the period 1883 to 2014 by 39.28 – 38.86 = 0.42 basis points (less than one half of one basis point). In other words, the impact of using high and low prices listed in the SSE *Monthly Stock and Share List* and other sources instead of end-of- quarter buy and sell prices is negligible.

The fourth change that we make is to use high and low prices for December 1921 and December 1931 extracted from the *Sydney Morning Herald* – which provide a more complete coverage of the days in these months – in place of the high and low prices listed in the SSE *Monthly Stock and Share List.* The impact of this change, shown in the column labelled

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[44] Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, page 48.

[45] The list of companies that Lamberton uses to construct his price series from 1936 to 1957 are provided in his 1959 book.

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, pages 85-90.

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

[47] http://trove.nla.gov.au/work/34506689?q=TJ+Thompson+and+Sons&c=article&versionId=42698882

'SMH highs and lows', is to lower our estimate of the *MRP* over the period 1883 to 2014 by 38.28 – 36.68 = 2.60 basis points lower. In other words, the impact is small.

Our final estimate of the *MRP* that employs all of these changes is 6.55 per cent per annum for the period 1883 to 2014 and this estimate sits 36.68 basis points above an estimate that uses the adjustment factor of 0.75 that the AER uses. [48] This estimate is computed under the assumption that the market places a value of 35 cents on a dollar of imputation credits distributed. [49] The standard error attached to the estimate is 1.44 per cent per annum.

Table 2.1

Value-weighted yield estimates for 1883 to 1951 computed using firms employed in constructing the price series that Brailsford, Handley and Maheswaran (2012) use

Year	Existing data	Without pref-erence shares	With 1883 data	SSE highs and lows	SMH highs and lows
1883			8.14	8.19	8.19
1891	8.97	8.97	8.97	8.54	8.54
1901	5.78	5.78	5.78	5.97	5.97
1911	5.26	5.26	5.26	5.26	5.26
1921	7.37	7.37	7.37	7.49	7.24
1931	4.39	4.39	4.39	4.54	4.46
1941	5.30	5.29	5.29	5.09	5.09
1951	4.27	4.26	4.26	4.33	4.33
Mean	5.90	5.90	6.18	6.18	6.13
Impact	35.88	35.72	38.86	39.28	36.68

Note: The row labelled 'Impact' shows the impact in basis points on an estimate of the MRP of using the value-weighted yields in each column to construct a series of adjustment factors for use with Lamberton's yield series rather than the adjustment factor of 0.75 employed by Brailsford, Handley and Maheswaran (2012). SSE refers to the Sydney Stock Exchange while SMH refers to the Sydney Morning Herald.

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.

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[48]   AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, page 331.

[49]   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] ACompT9, May 2011.

Using the yields that Lamberton (1961) provides, the value-weighted yields provided in the last column of Table 2.1, labelled 'SMH highs and lows', and linear interpolation we compute a series of adjustment factors. [50] These adjustment factors are shown in Figure 2.1. The figure shows that the adjustment factor has fallen almost monotonically through time but for the years 1883 through 1921, lies some way above the adjustment factor of 0.75 employed by Brailsford, Handley and Maheswaran (2012). [51]

Figure 2.1
Adjustment factors

Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, 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

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[50]   Lamberton, D., *Ordinary share yields: A new statistical series*, Sydney Stock Exchange Official Gazette, 14 July 1961.
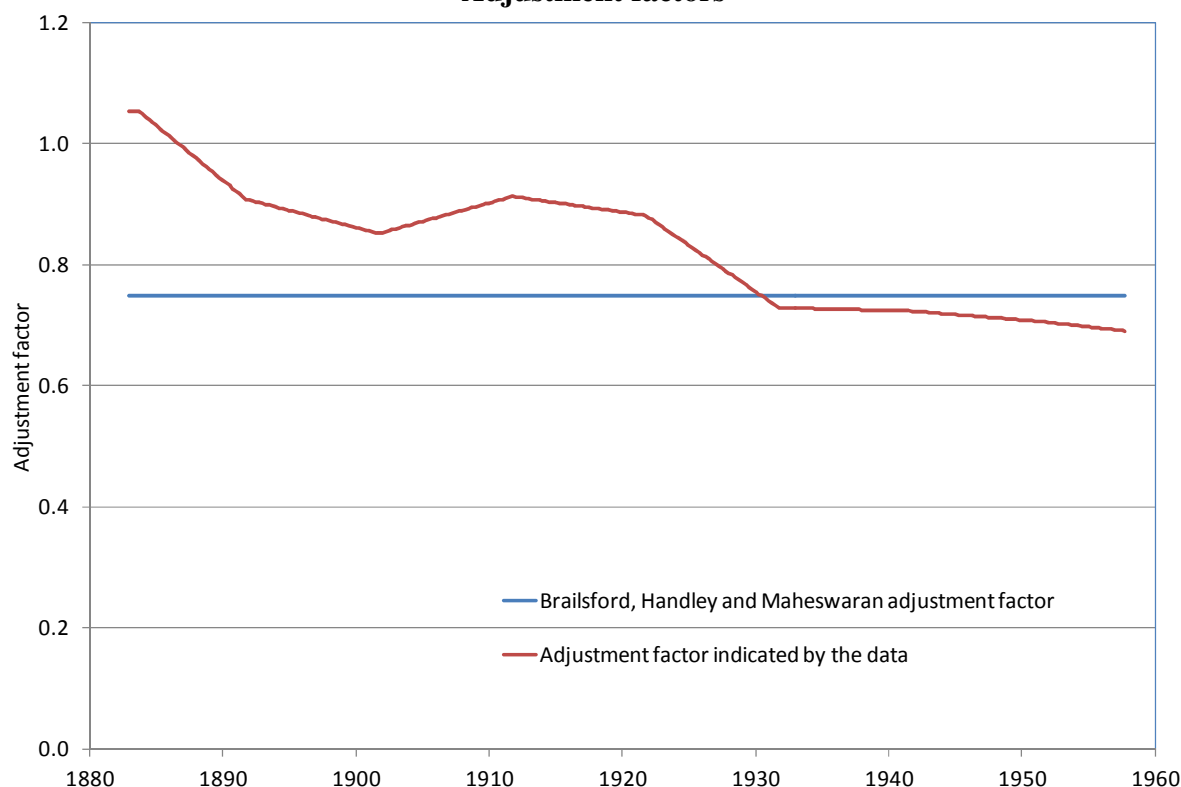
[51]   Brailsford, T., J. Handley and K. Maheswaran, *The historical equity risk premium in Australia: Post-GFC and 128 years of data*, Accounting and Finance, 2012, pages 237-247.

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

2.2.   Reproducing Lamberton's Yields

Handley (2015) and the AER (2015) suggest that the adjustments that we make to Lamberton's data are unreliable because of small differences between an equally weighted yield series that we construct and the equally weighted yield series that Lamberton (1961) provides. [52] We emphasise in our February 2014 report that we do not use the equally weighted yields that we compute to construct an estimate of the *MRP*. [53] We use instead the value-weighted yields that we compute that employ only those stocks that Lamberton uses to produce his price index. We compute equally weighted yields solely so that we can examine how closely we can come to recreating Lamberton's yields, which are also equally weighted, for the quarters that we examine. Here we examine the impact of interpreting a reference made by the SSE *Official Gazette* to 'all ordinary shares' as not to the shares that Lamberton uses to construct his price indices, but instead to all shares irrespective of whether they play a role in constructing a series of prices. [54]

Table 2.2 provides estimates of the dividend yields attached to an equally weighted portfolio of the stocks that Lamberton (1958) employs in constructing his price indices. [55] Our estimates do not match the estimates that Lamberton (1961) provides, but are strongly correlated with his estimates over time. [56] The correlation between our estimate of the equally weighted average yield to dividend paying issues (firms) and his estimate is 0.92 (0.93) across the eight years that we examine. Also, the means of our series come close to matching the mean of his estimates. The mean of our eight estimates of the equally weighted average yield to dividend paying issues (firms) is 7.22 (7.21) per cent per annum while the mean of his eight estimates is 7.18 per cent per annum.

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[52]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 340.

Handley, *Further advice on the return on equity*, April 2015, pages 8-9.

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

[53]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, page 35.

[54]   The list of companies that Lamberton uses to construct his price series from 1875 to 1936 are provided in the SSE *Official Gazette* of 14 August 1958.

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

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

Lamberton, D., *Share price indices in Australia*, Sydney: Law Book Company, 1958, page 48.

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

Figure 2.2
Lamberton and adjusted dividend yields
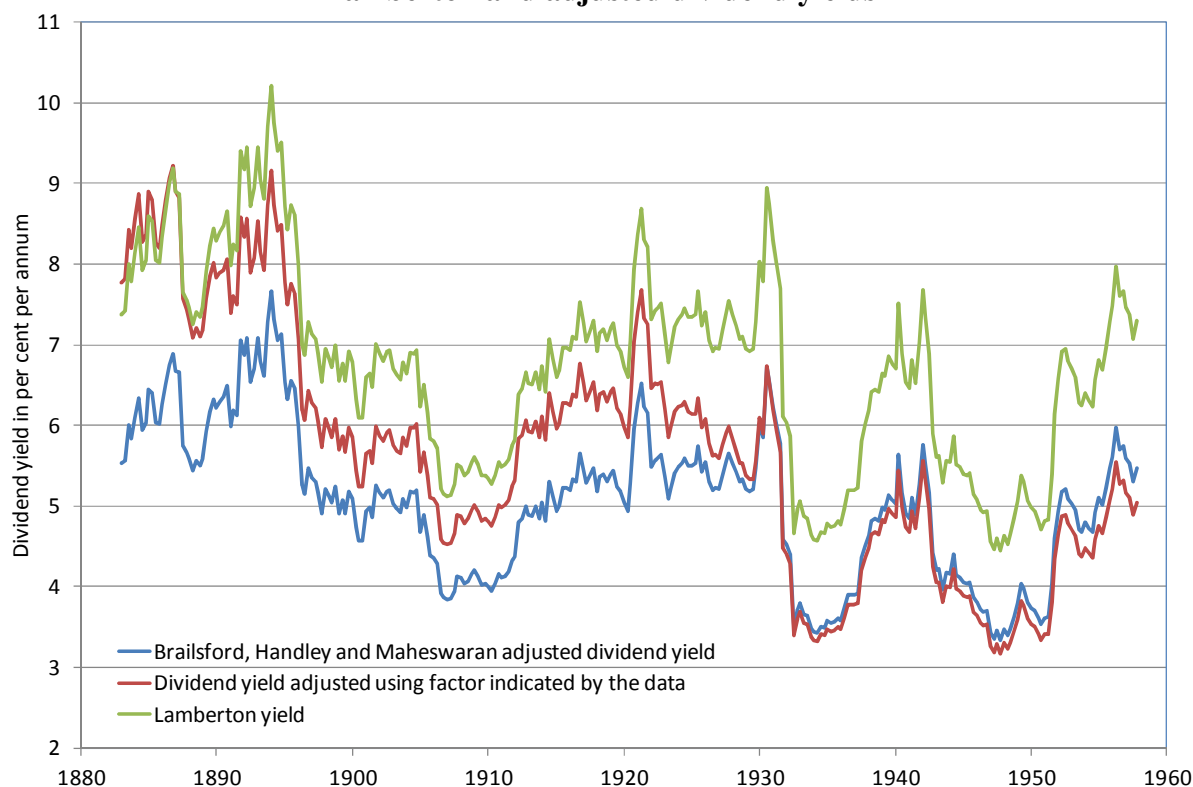
Sources: Various issues of the Argus , Australasian Insurance and Banking Record, Australian Town and Country Journal, Sydney Morning Herald, Sydney Stock Exchange Official Gazette, T. J. Thompson and Sons' monthly Stock and Share Reports,

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.

Table 2.3 provides estimates of the yields to an equally weighted portfolio of all stocks for which yields are provided by TJ Thompson and Sons' monthly *Stock and Share Reports* and the SSE *Monthly Stock and Share List* – the two sources that Lamberton (1961) uses. [57] We use the column labelled 'Rate of Return Investment Per Cent' in the *Stock and Share Reports* and the column labelled 'Rate of Return on Investment' in the *Monthly Stock and Share List*. Again, the *Stock and Share Reports* January 1912 edition is missing. Lamberton states that he uses 'all ordinary shares' but an inspection of the data suggests that he uses all shares including preference shares. Removing preference shares leads to a poorer match between our results and his results – in particular, for the years 1921 to 1951 – and so we retain the data for preference shares. Table 2.3 shows that for the years 1901 and 1921 through 1951 the match between our results and the results that Lamberton provides is almost perfect. For

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

the years 1883 and 1891 the match, while better than the match shown in Table 2.2, is not perfect. That the match is not perfect is not surprising because we cannot be sure that Lamberton limited his attention to the data provided in the column labelled 'Rate of Return Investment Per Cent' in the *Stock and Share Reports*. The reports provide other information that he may have used. Nevertheless, overall the match between our results and those that Lamberton provides is good. Using the data in Table 2.3, the correlation between our estimate of the equally weighted average yield to dividend paying issues (firms) and his estimate is 1.00 (0.98) (rounded to two decimal places) across the seven years that we examine. The mean of our seven estimates of the equally weighted average yield to dividend paying issues (firms) is 7.43 (7.38) per cent per annum while the mean of his seven estimates is 7.38 per cent per annum.

Table 2.2
Equally weighted averages of dividend yields for 1883 to 1951 computed using dividend-paying firms that Lamberton (1958) employs in constructing his price indices

	Yields			Observations	
Year	Lamberton	Issues	Firms	Issues	Firms
1883	7.78	7.41	7.56	17	16
1891	9.40	10.81	11.40	20	17
1901	7.01	8.25	7.83	28	25
1911	5.76	5.76	5.71	32	30
1921	8.21	7.80	7.70	45	41
1931	6.11	5.73	5.54	41	36
1941	7.03	6.60	6.64	116	106
1951	6.14	5.42	5.28	169	158

Sources: The column labelled 'Lamberton' uses data that Lamberton (1961) provides while all other columns use data that we collect. The data that we collect are from various issues of the Argus, Australasian Insurance and Banking Record, Australian Town and Country Journal, Brisbane Courier, Mercury, Sydney Morning Herald, SSE Official Gazette, SSE Monthly Stock and Share List and 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.

The results provided by Table 2.3 suggest that we are able to come close to reproducing the results that Lamberton (1961) reports over 50 years ago. [58]

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

Table 2.3
Equally weighted averages of dividend yields for 1883 to 1951 computed using all firms in sources that Lamberton (1958) employs for which a yield is provided

Year	Yields			Observations	
	Lamberton	Issues	Firms	Issues	Firms
1883	7.78	7.96	8.00	31	30
1891	9.40	9.63	9.79	48	42
1901	7.01	6.90	6.37	50	44
1911	5.76				
1921	8.21	8.21	8.18	165	129
1931	6.11	6.13	6.00	82	74
1941	7.03	7.03	7.10	201	173
1951	6.14	6.14	6.20	258	225

Sources: The column labelled 'Lamberton' uses data that Lamberton (1961) provides while all other columns use data that we collect. The data that we collect are from the SSE Monthly Stock and Share List and 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.

3.   Issues Raised by the AER and its Advisors

The AER and its advisors have raised a number of issues about our February 2015 submission and about a number of other matters and here we address these issues. [59]

3.1.   Arithmetic Versus Geometric Averaging

In a March 2012 report we emphasise that an estimate of the long-run weighted average cost of capital (*WACC*) that is based on the arithmetic mean of a sample of annual excess returns to the market portfolio will – so long as the other components of the *WACC* have been correctly computed and ignoring minor adjustments to the regulated asset base (*RAB*) and to the evolution of prices – produce an unbiased estimate of the revenue that the market will require in any one year, in the long run, on the *RAB*. [60] We also emphasise in the report that, 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 excess returns to the market portfolio will produce a downwardly biased estimate of the revenue that the market requires in any one year.

While an estimate of the *WACC* compounded over more than one year, based on the arithmetic mean of a sample of annual excess returns to the market portfolio, will be biased, the AER, aside from some minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, never compounds the *WACC* over more than one year. [61] Thus we recommend that for long-run estimates of the *MRP* the AER should rely solely on estimates that use arithmetic means and that the AER should place no weight on estimates that use geometric means. An estimate of the *MRP* that relies solely on estimates that use arithmetic means will provide a materially better estimate than an estimate that relies either fully or in part on geometric means.

We note that in independent advice provided at the request of the Queensland Competition Authority in July 2012, Associate Professor Lally, an advisor to the AER, reaches the same conclusion as we do and states that: [62]

> 'The AER's belief that geometric averages are useful apparently arises from a belief
> that there is a compounding effect in their regulatory process (AER, 2012, Appendix

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[59]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015.

[60]   NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

[61]   Our March 2012 report details the minor adjustments that the AER makes that involve compounding. These have to do with the timing of capital expenditure, difference between actual and forecast capital expenditure and the smoothing of prices.

       NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 7-9.

[62]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

A.2.1), and therefore the analysis of Blume (1974) and Jacquier et al (2003) applies. However, I do not think that there is any such compounding effect in regulatory situations and the absence of a compounding effect leads to a preference for the arithmetic mean over the geometric mean.'

'If historical average returns are used, they should be arithmetic rather than geometric averages.'

The AER continues to ignore the advice that Lally provides in July 2012 and the advice that we provide in March 2012 and June 2013 and instead relies on advice provided by McKenzie and Partington in December 2011 and February 2012 and Partington and Satchell in May 2015. [63] McKenzie and Partington, and Partington and Satchell note that an estimate of the *WACC*, compounded over more than one year, that is based on the arithmetic mean of a sample of annual excess returns to the market portfolio will be biased. McKenzie and Partington, and Partington and Satchell, however, do not point to where in the regulatory process they believe the AER compounds an estimate of the *WACC*. Again, apart from minor adjustments to the *RAB* and to the evolution of prices, the AER never compounds an estimate of the *WACC*.

3.1.1. Partington and Satchell

In their May 2015 report, Partington and Satchell make two claims. [64] The first claim is that it is unclear whether the AER compounds an arithmetic mean. Partington and Satchell state that: [65]

'it seems to be a matter for the AER to determine whether it views the regulated return it is setting as an annual return, or a return to be earned over five years, or some other period.'

Whether the AER compounds an arithmetic average will depend not on the view of the AER but what the AER actually does. As we state in our February 2015 report: [66]

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[63]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

McKenzie, M. and G. Partington, *Report to Corrs Chambers Westgarth: Equity market risk premium*, 21 December 2011, pages 10-12.

McKenzie, M. and G. Partington, *Report to the AER: Supplementary report on the equity market risk premium*, SIRCA Limited, 22 February 2012, pages 5-9.

NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 25-30.

Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, pages 16-17.

[64]   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, pages 16-17.

[65]   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

'while an estimate of the *WACC* compounded over more than one year, based on the arithmetic mean of a sample of annual excess returns to the market portfolio, will be biased, the AER, aside from some minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, never compounds the *WACC* over more than one year. In addition, the AER has not demonstrated that it compounds the *WACC* over more than one year and McKenzie and Partington have not demonstrated that the regulator compounds the *WACC*. In other words, the AER and these two advisors have not pointed to a document or workbook that the regulator has issued that demonstrates that, setting aside minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, it compounds the *WACC*.'

If the AER and Partington and Satchell believe that the AER compounds an arithmetic mean, then they should point out where in the regulatory process the regulator does so. In other words, if they believe that the AER compounds an arithmetic mean, they should point to a document or workbook that will support their belief. Providing evidence to support a belief that the AER compounds an arithmetic mean is not something that the AER or its advisors have been prepared to do to date. Our analysis indicates that the AER, aside from some minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, never compounds the *WACC* over more than one year.

The ACT in a 2012 decision states about the *MRP* that: [67]

'the relevant benchmark (is) ... a ten year rate, expressed in annual terms.'

As we point out in our March 2012 report, however, if the AER ever were to compound an estimate of the *WACC* over 10 years, it would then need to convert the 10-year return back to an annual return, thus reversing any compounding, so that it could use the annual return to determine the annual revenue requirement for each year of a regulatory control period. [68] Although we have gone over this point before, it is worth making it crystal clear since it is a matter over which the Australian Competition Tribunal (ACT) in its 2012 decision is confused. [69]

The raw material with which the AER has to work is the set of arithmetic mean annual excess return and geometric mean excess return estimates that it computes, *A* and *G,* where:

$$A = \sum_{t=1}^{T} \frac{R(t)}{T}, \tag{1}$$

where

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[66]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, page 15.

[67]   ACT, *Application by Envestra Limited (No 2) [2012] ACompT 3 (11 January 2012)*, paragraph 151.

[68]   NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

[69]   ACT, *Application by Envestra Limited (No 2) [2012] ACompT 3 (11 January 2012)*, paragraphs 148-155.

$R(t)$ =   one plus the return in year t to a portfolio that is long the market portfolio and short the 10-year bond;

T =   the number of annual observations; and

$$G = \left(\prod_{t=1}^{T} R(t) \right)^{1/T} \tag{2}$$

Estimates of the 10-year mean excess return to the market derived by compounding these two estimates are:

$$A^{10} - 1 \qquad \text{and} \qquad G^{10} - 1 \tag{3}$$

Again, the two estimates in (3) are estimates that involve compounding. As Blume (1974) shows, the first of these estimates, based on the arithmetic mean A, will be biased upwards while if $T > 10$, the second estimate, based on the geometric mean G, will be biased downwards.[70] Thus, without a doubt, compounding an arithmetic mean can create an estimate that is upwardly biased. The corresponding estimates of the 'relevant benchmark ... expressed in annual terms' are:

$$(1 + A^{10} - 1)^{1/10} = A \qquad \text{and} \qquad (1 + G^{10} - 1)^{1/10} = G \tag{4}$$

The estimates in (4) are quite clearly not compounded. As Blume (1974), again, shows, the first estimator, the arithmetic mean, will be an unbiased estimator of the long-run mean while the second estimator, the geometric mean, will be biased downwards.[71]

We are therefore forced to conclude that the ACT, which had not had the benefit of reading our March 2012 and June 2013 submissions or the advice of Lally provided in July 2012, is in error when it states that:[72]

> 'Envestra's submission that ... only the arithmetic mean may be used cannot be accepted once it is understood that the arithmetic mean of annual historic returns is not an unbiased estimate of ten year returns.'

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[70]   Blume, M., *Unbiased estimators of long-run expected rates of return*, Journal of the American Statistical Association, 1974, page 635.

[71]   Blume, M., *Unbiased estimators of long-run expected rates of return*, Journal of the American Statistical Association, 1974, page 635.

[72]   ACT, *Application by Envestra Limited (No 2) [2012] ACompT 3 (11 January 2012)*, paragraph 154.

Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 25-30.

The second claim that Partington and Satchell make in their May 2015 report is that whether an arithmetic mean or a geometric mean or some combination of the two will represent a better measure of the expected return to equity will depend on the distribution of returns through time and, in particular, whether returns are identically and independently distributed through time. [73] Partington and Satchell do not state whether they are referring to the expected return to equity measured over one year or over many years. So it is left to the reader to determine whether the results that they cite are in any way relevant to the task of estimating the expected return to equity over one year – which, as we emphasise and Lally (2012) emphasises, is the task that the AER must tackle. [74] In what follows we will endeavour to assist the reader.

Partington and Satchell begin their analysis with an example: [75]

> 'Assume that you invest $100 and it shrinks to $50 by the end of the first year, this equates to a negative 50% return. In the second year the invested amount grows to $100 and thus gives a positive 100% return for that year. The actual portfolio return over the two year period is 0% and this is the geometric average, however, the arithmetic average return is 25%, [(-0.50 + 1.00)/2].'

Assume that in any year the outcome recorded in each year of the example is equally likely to occur and that, as in the example, a return of 100 per cent always follows a return of -50 per cent. These two assumptions will ensure that the asset will deliver a certain return if held for two years but an uncertain return if held for only one year. With the assumptions, the unconditional mean return over any one-year period will be 25 per cent and over any two-year period will be zero. [76] So in the example, the arithmetic mean will provide an unbiased estimate of the unconditional mean return to the asset over any one year while the geometric mean will provide a downwardly biased estimate. On the other hand, the arithmetic mean compounded over two years will provide an upwardly biased estimate of the unconditional mean return to the asset over any two years while the geometric mean will provide an unbiased estimate. These results are consistent with the analysis of Blume (1974). [77] Importantly, the choice between whether to use an arithmetic mean or a geometric mean will hinge on whether an estimate is to be compounded. Again, apart from minor adjustments to the *RAB* and to the evolution of prices, the AER never compounds an estimate of the *WACC*.

In the example, however, returns are serially dependent and so this serial dependence can be used to generate a better estimate of the return to the asset over the next year. If the return in

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[73] Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

[74] Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

[75] Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

[76] An unconditional mean is a mean that is not conditioned on information like the previous year's return. In contrast, a conditional mean will use information like the previous year's return.

[77] Blume, M., *Unbiased estimators of long-run expected rates of return*, Journal of the American Statistical Association, 1974, page 635.

the previous year is -50 per cent, then we know that the return over the following year will be 100 per cent – not 25 per cent or zero per cent. So our best forecast of the return in the following year will be 100 per cent. If the return in the previous year is 100 per cent, then we know that the return over the following year will be -50 per cent – again, not 25 per cent or zero per cent. So our best forecast of the return in the following year will be -50 per cent. On average, our best forecast that uses the return realised over the previous year will be (100 – 50) ÷ 2 = 25 per cent. So, on average, a forecast based on the arithmetic mean will be conditionally unbiased while a forecast based on the geometric mean will be conditionally biased downwards.

Again, neither the AER nor Partington and Satchell have been able to show that the AER – aside from in making minor adjustments – ever compounds an annual estimate of the *WACC*. So the issue is whether it is better to use an arithmetic mean return that has not been compounded, a geometric mean return that has not been compounded or a combination of the two to estimate the expected return to equity over a single year. We know of no academic work, and the AER and Partington and Satchell do not refer to any academic work, that suggests that a geometric mean, that has not been compounded, provides a better estimate of the mean return to equity over a single year than does an arithmetic mean, that has not been compounded, when returns are not identically and independently distributed through time. Similarly, we know of no academic work, and the AER and Partington and Satchell do not refer to any academic work, that suggests that a combination of an arithmetic mean, that has not been compounded, and a geometric mean, that has not been compounded, provides a better estimate of the mean return to equity over a single year than does an arithmetic mean, that has not been compounded, when returns are not identically and independently distributed through time.

Partington and Satchell cite the work of Akgiray (1989) as an example of someone who has found evidence against the hypothesis that returns are identically and independently distributed through time. [78] Akgiray finds that daily returns follow an autoregressive process with an autoregressive parameter of around 0.3. We know of no evidence that the AER has ever contemplated basing an estimate of the *MRP* in part on the performance of the market on the day before a decision is released and so it is difficult to see the practical significance of this part of Akgiray's work to the issue of estimating the *MRP*.

Akgiray (1989) also finds evidence that the volatility of returns wanders through time. [79] Kearns and Pagan (1993) show that the Australian market portfolio was substantially less risky in the later part of the 19th century and the earlier part of the 20th century than in the later part of the 20th century. [80] In our February 2015 report, we show how one can use this

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[78]   Akgiray, V., *Conditional heteroscedasticity in time series of stock returns: Evidence and forecasts*, Journal of Business, 1989, pages 55-80.

   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

[79]   Akgiray, V., *Conditional heteroscedasticity in time series of stock returns: Evidence and forecasts*, Journal of Business, 1989, pages 55-80.

[80]   Kearns, P. and A. Pagan, *Australian stock market volatility: 1875-1987*, Economic Record, 1993, pages 163-178.

sort of information to bias-adjust an estimate of the mean real return to the market that is based on a geometric mean. [81] Using the information leads to an estimate of the mean real return to the market that sits around 100 basis points above an estimate that is based on an arithmetic mean that ignores shifts in volatility. We emphasise here, as we emphasise in our February 2015 report, however, that the bias-adjusted geometric mean that we employ only uses a geometric mean as an input in computing an estimate and not as a final estimate of the mean real return to market.

 Finally, Partington and Satchell (2015) state that: [82]

> 'Jacquier, Kane and Marcus (2003) claim that academics tend to use the arithmetic return and that practitioners tend to use the geometric return.'

What Partington and Satchell do not say is that the work of Jacquier, Kane and Marcus (2003) is about forecasting the growth of a portfolio over many years rather than using a series of annual returns to forecast the return over a single year. [83] In the opening paragraph of their paper, Jacquier, Kane and Marcus state that:

> 'Increased concern for long-term retirement planning, the growth of the defined contribution investment market, and proposals for U.S. Social Security reform have all focused considerable attention on forecasts of long-term portfolio returns. Moreover, recent academic studies suggest that conventional estimates of long-term performance, such as those guided by historical averages from the database in the Ibbotson Associates yearbooks, Stocks, Bonds, Bills and Inflation (SBBI), may paint far too rosy a picture of likely future performance.'

This is a view with which few would disagree but it has nothing to do with the problem that the AER faces of estimating the *WACC* over one year using a series of historical annual returns. The abstract to the Jacquier, Kane and Marcus paper makes this even clearer because it includes the word 'compound' no less than four times.

3.1.2.   AER

3.1.2.1.   Comments

The AER states that: [84]

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[81]   NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015, pages 17-20.

[82]   Partington, G. and S. Satchell, *Report to the AER: Return of (sic) equity and comment on submissions in relation to JGN*, May 2015, page 17.

[83]   Jacquier, E., Kane, A. and Marcus, A.J., *Geometric or arithmetic mean: A reconsideration*, Financial Analysts Journal, 2003, pages 46-53.

[84]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, pages 333-334.

'We have previously considered arithmetic and geometric averages relevant when estimating a 10 year forward looking MRP using historical annual excess returns. The Australian Competition Tribunal (Tribunal) found no error with this approach.'

Again, the AER has been unable to point to where in the regulatory process it compounds an estimate of the annual *MRP*. In particular, there is no evidence that the AER ever compounds an estimate of the annual *MRP* over 10 years. If the AER were to compound an estimate of the annual *MRP*, it would, as we have made clear above, immediately have to reverse the process to produce an estimate of the annual *MRP* for use in determining a firm's annual revenue requirement.

The AER states again that the ACT found no error in its approach but as we have pointed out here and in previous submissions the ACT did not have the opportunity of reading our March 2012 and June 2013 submissions or the advice of Lally provided in July 2012. [85]

The AER once more states that: [86]

'In their recent review for the Office of Gas and Electricity Markets (Ofgem), Wright and Smithers advocated using geometric average returns, adjusted for return volatility on the arithmetic average. Wright and Smithers based their reasoning on the distortions introduced by direct arithmetic averaging. While we do not adopt this approach, this indicates that experts and other regulators consider geometric averages valuable.'

The AER has ignored the advice we provide in our February 2015 report that: [87]

'It is important to note that the bias-adjusted geometric mean that we describe here only uses the geometric mean as an input in computing an estimate and not as a final estimate of the mean return to an asset. As Wright, Mason and Miles (2003) emphasise:

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[85]   ACT, *Application by Envestra Limited (No 2) [2012] ACompT 3 (11 January 2012)*, paragraphs 148-155.

Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

NERA, *Prevailing conditions and the market risk premium: A report for APA Group, Envestra, Multinet & SP AusNet*, March 2012, pages 3-16 and pages 57-59.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 25-30.

[86]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 334.

[87]   Cooper, I., *Comments on the Ofcom consultation document: Ofcom's approach to risk in the assessment of the cost of capital. The equity market risk premium*, London Business School, 18 February 2004, page 10.

NERA, *Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy*, February 2015.

Wright, S., R. Mason and D. Miles, *A study into certain aspects of the cost of capital for regulated utilities in the U.K.*, 2003, pages 23-27.

'There is no doubt that the ultimate aim must be to derive an estimate of the arithmetic mean return, since, as noted above, this corresponds to the theoretically desirable true expectation.'

In other words, Wright, Mason and Miles are not advocating that a regulator place a weight on the geometric mean of a series of returns. Cooper (2004) makes this clear in a submission to the British regulator Ofcom:

'Ofcom places weight on the geometric mean of historical returns, which is about two percent lower than the arithmetic mean. For its reliance on this number, it depends on Wright et al. Yet these authors favour the use of the geometric mean only as an interim step in the calculation of the arithmetic mean, not as an estimate in its own right, as used by Ofcom. Dimson et al reach a similar conclusion, and the vast majority of experts argue that unadjusted geometric averages are not the correct ones to use in setting the cost of capital for the application envisaged by Ofcom.''

The AER refers to a statement that McKenzie and Partington make that: [88]

'the unbiased estimator of the MRP lies between the arithmetic average and the geometric average'

but the statement is not in general correct because, as Blume (1974) shows, the arithmetic mean of a series of annual returns will provide an unbiased estimate of the true long-run mean of the series and thus will not lie between the arithmetic average and geometric mean. [89]

The AER also makes two comments about our analysis of how an estimate of the *WACC* is employed in the regulatory process. To make it clear to what the AER refers, we reproduce our analysis here. We note that our analysis differs little from the analysis of Lally (2012). [90]

3.1.2.2.   Analysis

The present value principle requires that:

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[88]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 334.

McKenzie, M. and G. Partington, *Report to the AER: Supplementary report on the equity market risk premium*, SIRCA Limited, 22 February 2012, page 5.

[89]   Blume, M., *Unbiased estimators of long-run expected rates of return*, Journal of the American Statistical Association, 1974, page 635.

[90]   Lally, M., *The cost of equity and the market risk premium*, Victoria University of Wellington, 25 July 2012, pages 31-32.

$$RAB(t) =$$

$$\sum_{s=1}^{5} \frac{\mathrm{E}(REV(t+s)) - \mathrm{E}(CAPEX(t+s)) - \mathrm{E}(OPEX(t+s)) - \mathrm{E}(TAX(t+s))}{(1+WACC)^s}$$

$$+ \frac{\mathrm{E}(RAB(t+5))}{(1+WACC)^5}, \qquad (5)$$

where

$RAB(t)$	=	the regulatory asset base of the firm at the end of year t;
$REV(t)$	=	the firm's revenue in year t;
$CAPEX(t)$	=	capital expenditure in year t;
$OPEX(t)$	=	operating expenditure in year t;
$TAX(t)$	=	company tax paid in year t; and
$WACC$	=	the firm's $WACC$ – a parameter unknown to the regulator.

Equation (5) states that the discounted value of the revenues that the *RAB* is expected to generate over the five years of the regulatory period plus the discounted value of the *RAB* five years from now must match the *RAB* today.

The present value principle also requires that:

$$\mathrm{E}(RAB(t+1)) =$$

$$\sum_{s=2}^{5} \frac{\mathrm{E}(REV(t+s)) - \mathrm{E}(CAPEX(t+s)) - \mathrm{E}(OPEX(t+s)) - \mathrm{E}(TAX(t+s))}{(1+WACC)^{s-1}}$$

$$+ \frac{\mathrm{E}(RAB(t+5))}{(1+WACC)^4}, \qquad (6)$$

Multiplying (5) by $(1+WACC)$ and then subtracting (6) from the result yields:

$$(1+WACC) \times RAB(t) - \mathrm{E}(RAB(t+1))$$

$$= \mathrm{E}(REV(t+1)) - \mathrm{E}(CAPEX(t+1)) - \mathrm{E}(OPEX(t+1)) - \mathrm{E}(TAX(t+1)) \qquad (7)$$

The evolution of the *RAB*, however, is governed by the asset-base roll-forward equation:

$$RAB(t+1) = RAB(t) + CAPEX(t+1) - DEP(t+1) \qquad (8)$$

where

$DEP(t)$	=	depreciation in year t.

So, from (7) and (8), the present value principle requires that:

$$E(REV(t+1)) = WACC \times RAB(t) + E(DEP(t+1))$$
$$+ E(OPEX(t+1)) + E(TAX(t+1)) \tag{9}$$

Equation (9) is the revenue equation and states that the revenue that the firm must earn must provide for a fair return on its assets, must cover the depreciation through time of those assets and must cover the firm's operating expenditure and the taxes that it must pay. It is straightforward to show that a condition similar to (9) must hold for revenue in each year $t+s, s>1$. So, if in each year revenue is generated using the revenue equation, then the present value principle will be satisfied.

If the regulator were to use, instead of (9), the revenue equation:

$$E(REV(t+1)) = ANYK \times RAB(t) + E(DEP(t+1))$$
$$+ E(OPEX(t+1)) + E(TAX(t+1)) \tag{10}$$

where $ANYK \neq WACC$ represents a return on the firm's assets that is not a fair return, then, in general, the present value principle (5) would not be satisfied. The condition:

$$RAB(t) =$$
$$\sum_{s=1}^{5} \frac{E(REV(t+s)) - E(CAPEX(t+s)) - E(OPEX(t+s)) - E(TAX(t+s))}{(1+ANYK)^s}$$
$$+ \frac{E(RAB(t+5))}{(1+ANYK)^5}, \tag{11}$$

would, however, be satisfied. The right-hand side of (11), though, will not represent the discounted value of the revenues that the *RAB* is expected to generate over the five years of the regulatory period plus the discounted value of the *RAB* five years from now because $ANYK \neq WACC$.

In cell F64 of the worksheet 'Analysis' in the workbook 'Distribution post-tax revenue model - Version 3 - January 2015 - Appendix B.xlsm' the AER checks that a condition like (11) is satisfied. [91] The asset-base roll-forward equation together with the revenue equation (11) dictate that the condition must be satisfied regardless of the properties of the estimator $ANYK$. In other words, checking that the condition (11) is satisfied will reveal nothing about the properties of the estimator $ANYK$. It is the properties of the estimator that a regulator employs that is our primary concern, however, and it is to this issue that we now turn.

Suppose that the regulator chooses to use the estimator *AERK*. Then expected revenue in year $t+s$ will be:

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[91] http://www.aer.gov.au/node/27616.

$$\mathrm{E}(REV(t+s)) = AERK \times \mathrm{E}(RAB(t+s-1)) + \mathrm{E}(DEP(t+s))$$

$$+ \mathrm{E}(OPEX(t+s)) + \mathrm{E}(TAX(t+s)), \qquad (12)$$

Note that, unlike the true *WACC*, *AERK* is not a parameter but is instead an estimator. In other words, *AERK* is a random variable. Substitution of the revenue equation (12) into the present value condition (5) yields:

$$RAB(t) =$$

$$\sum_{s=1}^{5} \frac{AERK \times \mathrm{E}(RAB(t+s-1)) - \mathrm{E}(CAPEX(t+s)) + \mathrm{E}(DEP(t+s))}{(1+WACC)^{s}}$$

$$\frac{\mathrm{E}(RAB(t+5))}{(1+WACC)^{5}}, \qquad (13)$$

Substitution of the asset-base roll-forward equation (8) into the present value condition (13) yields the condition:

$$(AERK - WACC) \sum_{s=1}^{5} \frac{\mathrm{E}(RAB(t+s-1))}{(1+WACC)^{s}} = 0 \qquad (14)$$

This condition will be satisfied only if the value for the *WACC* that the regulator chooses, *AERK*, matches the firm's *WACC*. The condition will be satisfied on average only if the value for the *WACC* that the regulator chooses, *AERK*, matches the firm's *WACC* on average, that is, only if:

$$\mathrm{E}(AERK) = WACC \qquad (15)$$

This condition states that the value for the one-period *WACC* that the regulator chooses, *AERK*, must be an unbiased predictor of the firm's true one-period *WACC*. An estimate of the *WACC* that is based on the arithmetic mean of a sample of annual excess 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 based on an estimate of the *MRP* that places a positive weight on the geometric mean of a sample of annual excess 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.

The return on capital typically makes up the largest single component of the building block revenue requirement and row 25 of the worksheet 'Analysis' in the workbook 'Distribution post-tax revenue model - Version 3 - January 2015 - Appendix B.xlsm' clearly shows that in determining the return on equity the AER never compounds the return on equity. [92, 93] In any year the return on equity is simply the product of the start-of-period equity portion of the *RAB* and the annual cost of equity – not compounded in any way.

The AER in its Jemena *Final Decision* argues that: [94]

> 'NERA may have made simplifying assumptions in coming to its view. For example, NERA may be assuming that all cash flows are paid out rather than invested at the end of each period'.

NERA does not assume that all cash flows are paid out rather than invested at the end of each period. To see this, consider the following simple example, where all figures are in millions of dollars.

$$CAPEX(t+s)=100, \quad DEP(t+s)=100, \quad OPEX(t+s)=50, \quad REV(t+s)=150,$$

$$TAX(t+s)=0, \quad s=1,2,...,5, \quad RAB(t)=100, \quad RAB(t+5)=100, \quad WACC=0 \qquad (16)$$

In the example, revenue less operating expenditure and taxes in each of years 1 through 5 is $150 million – $50 million = $100 million and so the cash flows available to invest at the end of each period amount to $100 million. Depreciation each year is $100 million and so using the cash flows to finance capital expenditure each year of $100 million is, as equation (8) shows, sufficient to maintain the *RAB* at $100 million.

The AER also states in its Jemena *Final Decision* that: [95]

> 'NERA may be assuming that there is no capital expenditure at the end of the first period'.

The statement is incorrect as the simple example above demonstrates. In the example, capital expenditure at the end of the first year, $CAPEX(t+1),$ is $100 million.

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[92]   For example, in the worksheet 'Outputs|Revenue' of the workbook 'AER Final Decision - JGN NSW GAAR 2015-20 - Revenue forecast model - RFM PTRM - PUBLIC.xlsm' the return on capital, depreciation, operating expenditure and taxes for the year 2016 in 2015 dollars represent $162.82 million, $64.97 million, $158.51 million and $5.68 million of a total revenue requirement of $391.98 million.

      http://www.aer.gov.au/node/24741.

[93]   http://www.aer.gov.au/node/27616.

[94]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, pages 335-336.

[95]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, pages 335-336.

3.1.3.   SACES

The AER also refers to comments made by the South Australian Centre for Economic Studies (SACES). [96] SACES states that: [97]

> 'The arithmetic mean has often been used in calculating the market risk premium and some researchers regard it as clearly superior to the geometric mean for calculating expectations (SFG Consulting, 2014a p. 44). However, this is only the case if annual returns on the stock market represent an independent and identically distributed process, which is not the case for equities which exhibit strong year to year negative serial correlation in returns (Delong and Magin 2009, p. 197). It is also the case that some authorities in the field of calculating equity premia regard geometric means as a better measure of the risk premium (see for example Dimson et al. 2011).
>
> In simulation studies, researchers have found that in cases where a stock market series exhibits negative serial correlation the arithmetic mean exhibits an upward bias and the geometric mean a downwards bias (Indro and Lee (1997) and Jacquier, Kane and Marcus (2003), quoted in McKenzie and Partington, (2012), p. 6). This suggests that the true value lies between the two averages.
>
> One option would be to treat the two averages as an upper and lower bound and use other information to pick a point estimate from within them. However, as for our purposes we need a single point estimate to combine with other estimates of the market risk premium, we have adopted the weighting scheme proposed by Jacquier, Kane and Marcus (2003) which gives the geometric mean a weight equal to the ratio of the investment horizon and the time period over which the average has been calculated (quoted in McKenzie and Partington, 2012, p. 7). Using the post-1988 returns and assuming the relevant investment horizon equals the five year regulatory period, this would mean giving the geometric mean a weight of 5/23 and the arithmetic mean a weight of 18/23.'

There are four points to make about the arguments that SACES makes. First, we know of no academic work that shows that the arithmetic mean will be superior to the geometric mean for calculating expectations *if and only if* annual returns are independent and identically distributed. Second, the geometric means that Dimson, Marsh and Staunton (2011) supply are intended for use in evaluating investment strategies over many, many years which is a very different task than determining an unbiased estimate of the mean return to the market over a single year. [98] Third, the references to an upward bias and Indro and Lee (1997) and Jacquier, Kane and Marcus (2003) are to estimates of mean returns over many periods or years and not over a single period or year and so the conclusion that 'the true value lies between the two averages' is not true for the task of estimating the mean return over a single period or year. [99] Fourth, the weighting

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[96]   AER, *Final Decision, Jemena Gas Networks (NSW) Ltd Access Arrangement 2015-20 Attachment 3 – Rate of return*, June 2015, page 337.

[97]   South Australian Centre for Economic Studies, *Independent estimate of the weighted average cost of capital (WACC) for SA Power Networks, 2015 to 2020 Final Report*, January 2015, pages 8-9.

[98]   Dimson, E., P. Marsh, and M. Staunton, *Equity premia around the world*, in P.B. Hammond, Jr., M.L. Leibowitz and L.B. Siegel (eds) Rethinking the Equity Risk Premium, 2011, pages 32-52.

[99]   Indro, D.C., and W.Y. Lee, *Biases in arithmetic and geometric averages as estimates of long-run expected returns and risk premia*, Financial Management, 1997, pages 81-90.

scheme that SACES suggests that one use ignores the fact that the AER, aside from some minor adjustments to the *RAB* and to the evolution of prices over the regulatory period, never compounds the *WACC* over more than one year. [100]

3.2.   Standard Errors

As Goetzmann and Ibbotson (2007) emphasise: [101]

> 'One of the major issues with statistical estimation of the realized equity risk premium is that a very long time series of stationary returns is required to achieve a high degree of confidence in the estimate. The longer the data series, the more accurate the equity risk premium calculation, as long as the fundamental expectations have remained the same.'

Thus we recommend that the AER use the longest time series available. In other words, we recommend that the AER use the entire time series that we provide from 1883 to 2014.

The AER in presenting estimates of the *MRP* provides estimates using both arithmetic means and geometric means over five overlapping periods – all of which include the period 1988 to 2014. [102] As we make clear above, no weight should be placed on estimates that use geometric means. Besides this problem, however, the use of overlapping data amounts to placing more weight on estimates that use data from 1988 to 2014 than estimates that use earlier periods. While this may appear a sensible strategy, the impact will be to reduce the precision of the estimates. [103] As things stand, however, this cannot be seen from the AER's presentation of the results because the AER provides no standard errors. We recommend that the AER remove the column of geometric means from its table of results and replace the geometric means with a column of standard errors. This at least will show how imprecise are estimates that rely on a small number of data points. Even this change, however, will do nothing to stop the reader from treating the five overlapping periods as though they were independent – which, of course, they are not. So better still would be for the AER to report an estimate of the *MRP* that uses all of the data and, in addition, estimates that use non-overlapping sub-periods.

Jacquier, E., Kane, A. and Marcus, A.J., *Geometric or arithmetic mean: A reconsideration*, Financial Analysts Journal, 2003, pages 46-53.

[100]   South Australian Centre for Economic Studies, *Independent estimate of the weighted average cost of capital (WACC) for SA Power Networks, 2015 to 2020 Final Report*, January 2015, pages 8-9.

[101]   Goetzmann, W.N. and R.G. Ibbotson, *The equity premium over the very long run*, in Handbook of the equity premium, ed. R. Mehra, Elsevier Science, 2007, Chapter 12.

[102]   AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, page 331.

[103]   See section 5 of our June 2013 report.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013, pages 31-38.

3.3.   Relation Between *MRP* and Risk-Free Rate

The AER states that: [104]

> 'The evidence has not satisfied us that there is a clear relationship (positive or negative) between the 10 year forward looking risk free rate and MRP.'

We note, however, as others have done, that it is also unclear that an increase of 100 basis points in the mean real return to a risk-free asset will be associated with an increase of 100 basis points in the mean real return to the market.

The evidence that we provide in our April 2015 analysis of independent expert reports indicates that, over a period of relatively minor changes in expectations of inflation, experts behave as if an increase in the risk-free rate of 100 basis points lowers the *MRP* by an amount that lies significantly above zero – and also lies significantly below 100 basis points. In other words, the evidence that we report is consistent with the hypothesis that experts behave as if an increase of 100 basis points in the mean real return to a risk-free asset will be associated with an increase of less than 100 basis points in the mean real return to the market.

3.4.   Views of the ASX

As we make clear in our June 2013 report, after reading the work of Brailsford, Handley and Maheswaran (2008), who state that they were provided with an annual accumulation index by the ASX, we contacted the ASX but were told that the ASX had no record of such an index. [105]

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 an employee of the ASX. It implies that the ASX do not possess the data provided to Brailsford, Handley and Maheswaran. Subsequently, the ASX has made clear that it has no opinion about how or if the series of dividend yields that Lamberton (1961)

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[104]   AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, page 351.

[105]   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.

NERA, *Market, size and value premiums: A report for the ENA*, June 2013, page 6.

provides should be adjusted. [106, 107] We also note that nobody has indicated that the ASX has ever published work that uses the constant 0.75 adjustment that Brailsford, Handley and Maheswaran employ.

These facts suggest that the AER's description of the 0.75 adjustment that Brailsford, Handley and Maheswaran employ as: [108]

> 'the ASX's adjustment'

on six separate occasions in the AER's recently published *Final decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20* is, at best, misleading and, moreover, difficult to reconcile with the statement that the AER makes in the decision that: [109]

> 'we did not state nor did we imply that the ASX has given its corporate endorsement to the series used by Brailsford et al'

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[106]   https://www.aer.gov.au/sites/default/files/United%20Energy%20-%20Submission%20on%20JGN%20draft%20decision%20-%20ASX%20letter%20to%20UED%20-%2027%20March%202015.pdf

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

[108]   AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, pages 339-342.

[109]   AER, *Final Decision Jemena Gas Networks (NSW) Ltd Access Arrangement 2015–20 Attachment 3 − Rate of return*, June 2015, page 342.

Appendix A.   Data Sources

We extract daily data (for days on which the market was open) for the All Ordinaries Index (AS30) and the All Ordinaries Accumulation Index (ASA30) from Bloomberg. Like Brailsford, Handley and Maheswaran (2008, 2012), we extract imputation credit yields for December of each year from the Australian Taxation Office (ATO).[110, 111] The ATO has yet to update the data that it provides for 2014 and so we use the credit yield for September 2014, 1.43 per cent per annum, which the ATO supplies, as a proxy for the credit yield for December 2014. Like Brailsford, Handley and Maheswaran, we take 90-day bank accepted bill rates, the yields on three-month Treasury notes and the yields on 10-year Commonwealth Government bonds from the Reserve Bank of Australia.[112] Also, like Brailsford, Handley and Maheswaran, we use the percentage change in the All Groups CPI for Australia from the last quarter of one year to the last quarter of the next year, provided by the Australian Bureau of Statistics, as a measure of inflation.[113]

Like Brailsford, Handley and Maheswaran (2008, 2012), we compute the annual with-dividend return to the market portfolio in data from 1981 onwards as the percentage change from one year to the next in the average December level of the All Ordinaries Accumulation Index.[114] To produce gross returns, we add to the with-dividend return 35 per cent of the credit return – that is, the ratio of the credits provided by the All Ordinaries within a year to the level of the index at the start of the year.[115] Like Brailsford, Handley and Maheswaran (2008, 2012), we compute an estimate of the *MRP* by averaging the difference between each year's gross return and the yield on a 10-year Commonwealth Government bond at the end of each year.

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[110]   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.

[111]   https://www.ato.gov.au/rates/company-tax---imputation--average-franking-credit---rebate-yields/?page=2#List_of_yields

[112]   http://www.rba.gov.au/statistics/index.html

[113]   http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6401.0Sep%202014?OpenDocument

[114]   https://www.ato.gov.au/rates/company-tax---imputation--average-franking-credit---rebate-yields/?page=2#List_of_yields

[115]   A value placed by the market of 35 cents on a dollar of credits distributed is the value laid down by the ACT in its May 2011 decision. See

   ACT, Application by Energex Limited (Gamma) (No 5) [2011] ACompT9, May 2011.

Appendix B.   Terms of Reference

Expert Terms of Reference

Further Assessment of the Historical MRP: A response to the AER's final decisions for the NSW and ACT electricity distributors

United Energy   **19 June 2015**

Background

The Australian Energy Regulator (AER) is empowered to make five yearly regulatory determinations that control the aggregate average prices charged by regulated energy network businesses. The National Electricity Rules provide for a Regulated Asset Base (RAB) to be established and updated annually and for an operational expenditure allowance. A further key component of the regulatory determination is the allowed rate of return for debt and equity (or weighted average cost of capital) for funding the business. The principal Rules governing how the AER sets the allowed rate of return on debt for electricity distribution businesses are contained in Rule 6.5.2 of the National Electricity Rules (see attached). The same Rules in essentially the same terms apply to gas distribution businesses.

When the AER exercises the relevant regulatory powers under the National Electricity Rules, it is also required to apply section 16 of the National Electricity Law (see attached). Specifically, section 16 provides that *the AER must, in performing or exercising an AER economic regulatory function or power – (a) perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the national electricity objective.…*That national electricity objective is set out in section 7 of the National Electricity Law as: '*The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to- (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system.*'

Additionally, the Rules require the AER to publish a Rate of Return Guideline which explains how the regulator intends to apply the Rules (attached). The AER has recently published final determinations for the NSW and ACT electricity networks, and for Jemena Gas Networks[116]. Preliminary determinations have also been published for the Queensland electricity distributors, and for SA Power Networks[117].

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[116]   See, for instance:

   AER (2015), Ausgrid distribution determination, 2015−16 to 2018−19, Attachment 3 – Rate of return, April 2015.

   AER (2015), FINAL DECISION, Jemena Gas Networks (NSW) Ltd, Access Arrangement 2015-20, Attachment 3 – Rate of return, June 2015.

[117]   See, for instance:

Engagement

You are engaged by Jones Day on behalf of United Energy and a consortium of other businesses to provide the work (set out below). Specifically, you have been retained by ActewAGL distribution, Australian Gas Networks, APA Group, AusNet Services, Citipower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks, and United Energy.

Scope of work

NERA Economic Consulting will provide an expert report on the historical *market risk premium* that:

1. Reviews and, where appropriate responds to matters raised in the preliminary determinations on estimates of historical market returns and historical excess market returns. The matters to be addressed should include (but not be limited to):

   (a) Datasets used to estimate historical returns, and any necessary adjustments to these datasets.

   (b) The reproducibility of the equally weighted dividend yields published by Lamberton.

   (c) Appropriate time periods for estimation of the MRP.

   (d) The requirement for sensitivity analysis when considering estimates of the historical mean MRP.

   (e) The use of geometric and arithmetic averages; and

   (f) Whether and, if so, how to adjust for the value of imputation credits.

2. Insofar as practical, updates the estimates of historical market returns and historical excess market returns from the earlier report[118] for:

   (a) New data available since the earlier report.

   (b) Matters raised in the preliminary determinations; and

   (c) Any other matters considered relevant in light of the preliminary determination that were not considered in preparing the earlier report.

AER (2015), PRELIMINARY DECISION, SA Power Networks determination, 2015−16 to 2019−20, Attachment 3 – Rate of return, April 2015

[118] NERA (2015), Historical estimates of the market risk premium, prepared by NERA Economic Consulting, A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy, February 2015.

In preparing the report, NERA Economic Consulting will:

    A. Consider any comments made by the AER, its experts and other regulators; and

    B. Use robust methods and data in producing any statistical estimates.

    C. Respond to any other matters raised by the Australian Energy Regulator (AER) in its recently published Final decision, Jemena Gas Networks (NSW) Ltd, Access arrangement 2015-20 and in other recent AER decisions.

Timeframe

The consultant should provide a final report by no later than 20th June, 2015.

Reporting

Jeremy Rothfield of United Energy and Multinet Gas will serve as the primary contact for the period of the engagement. His contact details are as follows:

Jeremy Rothfield
Economist
United Energy and Multinet Gas
Level 1
Pinewood Corporate Centre
43-45 Centreway Place
Mount Waverley VICTORIA 3149
P.O. Box 449
Mount Waverley VICTORIA 3149

Email: Jeremy.Rothfield@ue.com.au

Telephone: (03) 88469854

The consultant will prepare reports showing the work-in-progress on a regular basis. The consultant will make periodic presentations on analysis and advice as appropriate.

Conflicts

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

Compliance with the Code of Conduct for Expert Witnesses

Attached as **Annexure 1** is a copy of the Federal Court's Practice Note CM 7, entitled "Expert Witnesses in Proceedings in the Federal Court of Australia", which comprises the guidelines for expert witnesses in the Federal Court of Australia (Expert Witness Guidelines).

Please read and familiarise yourself with the Expert Witness Guidelines, and comply with them at all times over the course of your engagement with United Energy and Multinet Gas.

In particular, your report prepared for United Energy and Multinet Gas should contain a statement at the beginning of the report to the effect that the author of the report has read, understood and complied with the Expert Witness Guidelines.

Your report must also:

1. contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;

2. identify the questions that the expert has been asked to address;

3. set out separately each of the factual findings or assumptions on which the expert's opinion is based;

4. set out each of the expert's opinions separately from the factual findings or assumptions;

5. set out the reasons for each of the expert's opinions; and

6. otherwise comply with the Expert Witness Guidelines.

The expert is also required to state that each of the expert's opinions is wholly or substantially based on the expert's specialised knowledge.

The declaration contained within the report should be 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 report".

Please also attach a copy of these terms of reference to the report.

Fees

The consultant is requested to submit:

•   A fixed total fee for the project and hourly rates for the proposed project team should additional work be required; and

•   Details of the individuals who will provide the strategic analysis and advice.

Contacts

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

Nick Taylor (Jones Day)

Email: njtaylor@jonesday.com

Phone: 02 8272 0500

Kind regards

Nicolas Taylor

Partner

Appendix C.   Federal Court Guidelines

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FEDERAL COURT OF AUSTRALIA
Practice Note CM 7

EXPERT WITNESSES IN PROCEEDINGS IN THE
FEDERAL COURT OF AUSTRALIA

</div>

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[119], 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[120]

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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[119] 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].

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

2.   The Form of the Expert's Report[121]

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[122]; 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[123].

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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[121] Rule 23.13.

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

[123] 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[124].

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.

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J L B ALLSOP
Chief Justice
4 June 2013

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

Appendix D.   Curriculum 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

- Affiliated Industry Expert, NERA Economic Consulting, 2014-

- Special Consultant, NERA Economic Consulting, 2009-2014

- 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

Review of the Literature in Support of the Sharpe-Lintner CAPM, the Black CAPM and the Fama-French Three-Factor Model A report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks, and United Energy, March 2015, https://www.aer.gov.au/sites/default/files/United%20Energy%20-%20Submission%20on%20JGN%20draft%20decision%20-%20NERA%20Sharpe-Lintner%20Black%20CAPMs%20-%2027%20March%202015.pdf

Estimating Distribution and Redemption Rates from Taxation Statistics A report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks and United Energy, March 2015, https://www.aer.gov.au/sites/default/files/United%20Energy%20-%20Submission%20on%20JGN%20draft%20decision%20-%20NERA%20Redemption%20rates%20-%2027%20March%202015.pdf

Empirical performance of Sharpe-Lintner and Black CAPMs: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, AusNet Services, CitiPower, Energex, Ergon Energy, Powercor, SA Power Networks, and United Energy, February 2015, http://jemena.com.au/Gas/Jemena/media/jemenagasnetworksmedia/community-engagement-document/our-revised-regulatory-proposal/Appendix%2007.08%20NERA%20Empirical%20performance%20of%20the%20Sharpe-Lintner%20and%20Black%20CAPMs%20-%2026%20Feb%2015.pdf

Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy, February 2015, http://jemena.com.au/Gas/Jemena/media/jemenagasnetworksmedia/community-engagement-document/our-revised-regulatory-proposal/Appendix%2007.07%20NERA%20Historical%20estimates%20of%20the%20MRP%20-%2013%20Feb%2015.pdf

Robust regression techniques: A report for DBP, December 2014, https://www.erawa.com.au/cproot/13287/2/Submission%2012%20-%20Appendix%20F%20-%20Robust%20Regression.PDF

Imputation Credits and Equity Returns: A report for the Energy Networks Association, October 2013, http://www.aer.gov.au/sites/default/files/ENA,%20Attachment%204%20-%20NERA%20Report%20-%20Imputation%20Credits%20and%20Equity%20Prices,%20Submission%20to%20draft%20AER%20rate%20of%20return%20guideline%20-%2011%20Oct%202013.pdf

The Fama-French Three-Factor Model: A report for the Energy Networks Association, October 2013, http://www.aer.gov.au/sites/default/files/Essential%20Energy%20-%20Attachment%207.9_NERA_The%20Fama-French%20Three-Factor%20Model%20-%202014.pdf

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, http://www.aer.gov.au/sites/default/files/ENA,%20Attachment%203%20-%20NERA%20Report%20-%20The%20Market%20Risk%20Premiuml,%20Submission%20to%20draft%20AER%20rate%20of%20return%20guideline%20-%2011%20Oct%202013.pdf

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=dea0145155193503840d4275dccc6b56018&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=10e87413b13d1da23 cd55faf20a6918d&fn=Appendix%206.3D%20- %20NERA%20(4%20Jan%2010,%20ETSA)%20Payout%20ratio%20of%20regulated%2 0firms.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%2 0Distribution%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=4fcc57398775fe846 85434e0b749d76a&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%2 0Distribution%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=80cf978278d317e99 c34ae1878525573&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

Report qualifications/assumptions and limiting conditions

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25 June 2015

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TERMS OF REFERENCE
Further Assessment of the Historical MRP: A response to the AER's final decisions for the NSW and ACT electricity distributors

Background

The Australian Energy Regulator (AER) is empowered to make five yearly regulatory determinations that control the aggregate average prices charged by regulated energy network businesses. The National Electricity Rules provide for a Regulated Asset Base (RAB) to be established and updated annually and for an operational expenditure allowance. A further key component of the regulatory determination is the allowed rate of return for debt and equity (or weighted average cost of capital) for funding the business. The principal Rules governing how the AER sets the allowed rate of return on debt for electricity distribution businesses are contained in Rule 6.5.2 of the National Electricity Rules (see attached). The same Rules in essentially the same terms apply to gas distribution businesses.

When the AER exercises the relevant regulatory powers under the National Electricity Rules, it is also required to apply section 16 of the National Electricity Law (see attached). Specifically, section 16 provides that *the AER must, in performing or exercising an AER economic regulatory function or power – (a) perform or exercise that function or power in a manner that will or is likely to contribute to the achievement of the national electricity objective….*That national electricity objective is set out in section 7 of the National Electricity Law as: '*The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to- (a) price, quality, safety, reliability and security of supply of electricity; and (b) the reliability, safety and security of the national electricity system.*'

Additionally, the Rules require the AER to publish a Rate of Return Guideline which explains how the regulator intends to apply the Rules (attached). The AER has recently published final determinations for the NSW and ACT electricity networks, and for Jemena Gas Networks[1].

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[1] See, for instance:

Preliminary determinations have also been published for the Queensland electricity distributors, and for SA Power Networks[2].

Engagement

You are engaged by Jones Day on behalf of United Energy and a consortium of other businesses to provide the work (set out below). Specifically, you have been retained by ActewAGL distribution, Australian Gas Networks, APA Group, AusNet Services, Citipower, Energex, Ergon Energy, Jemena Electricity Networks, Powercor, SA Power Networks, and United Energy.

Scope of work

NERA Economic Consulting will provide an expert report on the historical *market risk premium* that:

1. Reviews and, where appropriate responds to matters raised in the preliminary determinations on estimates of historical market returns and historical excess market returns. The matters to be addressed should include (but not be limited to):

    (a) Datasets used to estimate historical returns, and any necessary adjustments to these datasets.

    (b) The reproducibility of the equally weighted dividend yields published by Lamberton.

    (c) Appropriate time periods for estimation of the MRP.

    (d) The requirement for sensitivity analysis when considering estimates of the historical mean MRP.

    (e) The use of geometric and arithmetic averages; and

    (f) Whether and, if so, how to adjust for the value of imputation credits.

2. Insofar as practical, updates the estimates of historical market returns and historical excess market returns from the earlier report[3] for:

(continued…)

AER (2015), Ausgrid distribution determination, 2015−16 to 2018−19, Attachment 3 – Rate of return, April 2015.

AER (2015), FINAL DECISION, Jemena Gas Networks (NSW) Ltd, Access Arrangement 2015-20, Attachment 3 – Rate of return, June 2015.

[2] See, for instance:

AER (2015), PRELIMINARY DECISION, SA Power Networks determination, 2015−16 to 2019−20, Attachment 3 – Rate of return, April 2015

(a) New data available since the earlier report.

(b) Matters raised in the preliminary determinations; and

(c) Any other matters considered relevant in light of the preliminary determination that were not considered in preparing the earlier report.

In preparing the report, NERA Economic Consulting will:

A. Consider any comments made by the AER, its experts and other regulators; and

B. Use robust methods and data in producing any statistical estimates.

C. Respond to any other matters raised by the Australian Energy Regulator (AER) in its recently published Final decision, Jemena Gas Networks (NSW) Ltd, Access arrangement 2015-20 and in other recent AER decisions.

Reporting

Jeremy Rothfield of United Energy and Multinet Gas will serve as the primary contact for the period of the engagement. His contact details are as follows:

Jeremy Rothfield
Economist
United Energy and Multinet Gas
Level 1
Pinewood Corporate Centre
43-45 Centreway Place
Mount Waverley VICTORIA 3149
P.O. Box 449
Mount Waverley VICTORIA 3149
Email: Jeremy.Rothfield@ue.com.au

Telephone: (03) 88469854

The consultant will prepare reports showing the work-in-progress on a regular basis. The consultant will make periodic presentations on analysis and advice as appropriate.

Conflicts

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

(continued…)

[3] NERA (2015), Historical estimates of the market risk premium, prepared by NERA Economic Consulting, A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy, February 2015.

Compliance with the Code of Conduct for Expert Witnesses

Attached as **Annexure 1** is a copy of the Federal Court's Practice Note CM 7, entitled "Expert Witnesses in Proceedings in the Federal Court of Australia", which comprises the guidelines for expert witnesses in the Federal Court of Australia (Expert Witness Guidelines).

Please read and familiarise yourself with the Expert Witness Guidelines, and comply with them at all times over the course of your engagement with United Energy and Multinet Gas.

In particular, your report prepared for United Energy and Multinet Gas should contain a statement at the beginning of the report to the effect that the author of the report has read, understood and complied with the Expert Witness Guidelines.

Your report must also:

1.   contain particulars of the training, study or experience by which the expert has acquired specialised knowledge;

2.   identify the questions that the expert has been asked to address;

3.   set out separately each of the factual findings or assumptions on which the expert's opinion is based;

4.   set out each of the expert's opinions separately from the factual findings or assumptions;

5.   set out the reasons for each of the expert's opinions; and

6.   otherwise comply with the Expert Witness Guidelines.

The expert is also required to state that each of the expert's opinions is wholly or substantially based on the expert's specialised knowledge.

The declaration contained within the report should be 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 report".

Please also attach a copy of these terms of reference to the report.

Fees

The consultant is requested to submit:

•   A fixed total fee for the project and hourly rates for the proposed project team should additional work be required; and

•   Details of the individuals who will provide the strategic analysis and advice.

Contacts

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

Nick Taylor (Jones Day)

Email: njtaylor@jonesday.com

Phone: 02 8272 0500

Kind regards

Nicolas Taylor

Partner

Annexure 1

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FEDERAL COURT OF AUSTRALIA
Practice Note CM 7
EXPERT WITNESSES IN PROCEEDINGS IN THE
FEDERAL COURT OF AUSTRALIA

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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[4], 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[5]

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.

2.   The Form of the Expert's Report[6]

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4   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].

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

6   Rule 23.13.

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[7]; 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[8].

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.

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[9].

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

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

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

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

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