Market Risk Premium: Response to selected issues arising out of the AER Final Decision for Envestra (South Australia)

Report for APA Group, Envestra, Multinet, and SP AusNet

29 March 2012

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1. Executive summary

Background and context

1. SFG Consulting (**SFG**) has been engaged by APA Group, Envestra, Multinet and SP AUSNet to consider a number of issues relating to market risk premium that arise in the AER Final Decision for Envestra (South Australia).

2. We have been asked to set out our expert opinion in respect of the following matters:

    a) Provide a summary of the AER's current views about the estimation of MRP;

    b) Provide an opinion on the appropriate method of averaging historical data;

    c) Provide an opinion about whether historical data should be adjusted for the assumed value of dividend imputation tax credits (theta) when estimating MRP; and

    d) Provide an opinion about whether qualitative macroeconomic commentary and survey information are of use in estimating MRP.

3. This report has been authored by Professor Stephen Gray. I am Professor of Finance at the UQ Business School, University of Queensland and Director of SFG Consulting. I have honours degrees in Commerce and Law from the University of Queensland and a PhD in Finance from the Graduate School of Business at Stanford University. I have over 15 years of experience in advising companies, government, and regulatory agencies on issues relating to weighted-average cost of capital. My CV is attached as an appendix to this report.

Declaration

4. I have been provided with a copy of the Federal Court Guidelines for Expert Witnesses and have prepared this report in accordance with them. In preparing this report, I have made all the enquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld from the Court.

5. I have undertaken consultancy assignments for Multinet in the past, however I remain at arm's length as an independent consultant.

Recent regulatory decisions

6. The Australian Energy Regulator (**AER**) has produced four recent final decisions, all of which adopt an estimate of MRP that differs from the AER's estimate of MRP in its Statement of Regulatory Intent (**SoRI**) from May 2009. Those decisions are:

    a) Final Decision: NT Gas: Access arrangement proposal for Amadeus Gas Pipeline, July 2011 (**Amadeus Pipeline Final Decision**);

    b) Final Decision: Envestra Ltd: Access arrangement proposal for the Qld gas network, June 2011 (**Envestra Qld Gas Final Decision**);

c) Final Decision: APT Allgas Ltd: Access arrangement proposal for the Qld gas network, June 2011 (**Allgas Qld Gas Final Decision**); and

d) Final Decision: Envestra Ltd: Access arrangement proposal for the SA gas network, June 2011 (**SA Gas Final Decision**).

7. This report addresses the issues relating to MRP from the SoRI and from the four recent final decisions that are listed above.

8. In those recent decisions, the AER sets out its view that:

a) Whereas the appropriate estimate of MRP was 6.5% in mid-2009, commensurate with conditions in financial markets at that time;

b) Conditions in financial markets have since improved so that the long-run average estimate of 6% is now appropriate.

9. In addition to the recent decisions of the AER, the Australian Competition Tribunal (**the Tribunal**) has recently addressed the issue of MRP in an application by Envestra (**Envestra MRP case**).[1] This report also addresses the issues relating to MRP from that case.

Summary of conclusions

10. Our primary conclusions are:

a) The AER's previous estimate of 6.5% should not be treated as an upper bound on MRP estimates because it was not based on any analysis;

b) The AER indicates that it has placed some reliance on geometric averages of historical data. It is incorrect to do so, and correcting that error would lead to higher estimates of MRP;

c) All MRP estimates must be "grossed up" to reflect the assumed value of dividend imputation franking credits – such that internal consistency is preserved throughout the WACC estimation process. In this regard, survey estimates that make no allowance for franking credits cannot be compared with an AER estimate that *does* reflect an assumed value of franking credits; and

d) The AER places some reliance on macroeconomic commentary. More direct evidence about the current conditions in the market for funds can be obtained from current prices in the market for funds, than from the text of various pieces of macroeconomic commentary.

[1] Application by Envestra Ltd (No 2) [2012] ACompT 3.

2. Summary of AER's current views about estimates of MRP

View on MRP expressed in the WACC Review Final Decision

11. As set out below, the AER view is that:

    a) The best long-run average estimate of MRP is 6%; and that

    b) The MRP varies from time to time with changing conditions in financial markets, in which case the best estimate of MRP is above 6% at some points in time and below 6% at others.

12. For example, in the WACC Review Final Decision in May 2009 the AER concluded that:

> …prior to the onset of the global financial crisis, an estimate of 6 per cent was the best estimate of a forward looking long term MRP, and accordingly, under relatively stable market conditions—assuming no structural break has occurred in the market—this would remain the AER's view as to the best estimate of the forward looking long term MRP.[2]

13. In the WACC Review Final Decision the AER further concluded that:

> …while theoretically the MRP could avary [sic] over time in line with different economic conditions the view of the AER and the JIA's advisers (Professor Officer and Dr Bishop) is that, unlike for the nominal risk-free rate, there is no adequate method to automatically update the MRP at the time of each reset determination.
>
> Yet the NER requires the AER to lock in either a value or method for each parameter. Given the lack of an appropriate method that could be used to update the MRP for each reset determination effected by this WACC review, the only alternative is that a value for the MRP be adopted.
>
> In relatively stable market conditions, the adoption of a value for the MRP (which then applies for multiple reset determinations) is unlikely to be a significant issue, as the long term estimate is likely to be the best estimate of forward looking expectations prevailing at any particular point in time.
>
> However, due to the global economic and financial crisis, relatively stable market conditions do not currently exist. While it is conditions at the time of the reset, rather than at the time of the WACC review which are relevant, the AER has taken into account current conditions to the extent these conditions are expected to prevail over the time of reset determinations affected by this review. In other words, as the AER is reviewing the WACC parameters now—including 'locking-in' a value for the MRP—to the extent that current conditions (at the time of this review) are expected to be maintained until the time of the determinations effected [sic] by this review, then current conditions remain a relevant consideration in determining what value should be 'locked-in' for the MRP.[3]

[2] WACC Review Final Decision, p. xiv.
[3] WACC Review Final Decision, pp. 44-45.

AER's current view

14. The recently expressed view of the AER is that:

    a) At the time of the WACC Review (May 2009) financial market conditions were such that the best estimate of MRP was 6.5%; but that

    b) Conditions in financial markets are now such that the best estimate of MRP is the long-run average estimate of 6%.

15. In the WACC Review Final Decision, the AER concluded that:

> …relatively stable market conditions do not currently exist and taking into account the uncertainty surrounding the global economic crisis…the AER considers that a MRP of 6.5 per cent is reasonable, at this time, and an estimate of a forward looking long term MRP commensurate with the conditions in the market for funds that are likely to prevail at the time of the reset determinations to which this review applies.[4]

16. In four recent final decisions, the AER has concluded that:

> The significant uncertainty that characterised markets at the time of the WACC review has substantially diminished. The prevailing conditions in the market for funds have eased.[5]

and

> The AER considers the evidence outlined above supports an MRP of 6 per cent as the best estimate of the MRP. It also indicates that the AER's approach of increasing the MRP to 6.5 per cent at the time of the WACC review is no longer appropriate.[6]

Interpretation of AER's Global Financial Crisis (GFC) estimate of 6.5%

17. In relation to the Global Financial Crisis (**GFC**) MRP estimate of 6.5%, I note that there is widespread agreement that the AER was correct to increase its estimate of the MRP during the GFC. There is less agreement about the magnitude of this increase and about the method by which that magnitude was determined. In particular, the SoRI provides no analysis of why the appropriate adjustment to the estimate of MRP (to reflect the effect of the GFC) is precisely 50 basis points.

18. An adjustment of 50 basis points is very small relative to the confidence intervals around any estimate of the MRP. For example, in his most recent report for the AER, Handley (2011a) reports that the 95% confidence interval for the point estimate of MRP based on data since 1958 (the period that is said to contain the most reliable data) is 12.5%.[7] This is 25 times the AER's 50 basis point

[4] WACC Review Final Decision, pp. xiv-xv.
[5] Amadeus Final Decision, p. 71; Allgas Qld Final Decision, p. 33; Envestra Qld Final Decision, p. 45; SA Final Decision, p. 50.
[6] Amadeus Final Decision, p. 72; Allgas Qld Final Decision, p. 34; Envestra Qld Final Decision, p. 46; SA Final Decision, p. 51.
[7] Handley (2011a) Table 1, p. 5.

adjustment in relation to the effects of the GFC. That is, the 50 basis point adjustment is very small, even relative to the estimation error surrounding the point estimate.

19. Moreover, the 50 basis point adjustment in the WACC Review Final Decision is not based on any calculations or modelling or analysis. Rather, the AER selected an estimate of 6.5% on the basis that:

> …having regard to the desirability of regulatory certainty and stability, the AER does not consider that the weight of evidence suggests a MRP significantly above 6 per cent.[8]

20. It might be argued that if 6.5% was an appropriate estimate of the MRP during the height of the GFC, and if the effects of the GFC have reduced, then the current estimate of MRP should be somewhat lower than 6.5%. However, this presupposes that 6.5% *was* an appropriate estimate of the MRP during the height of the GFC. But, as set out above, the WACC Review Final Decision provides no analysis of why the appropriate adjustment to the estimate of MRP (to reflect the effect of the GFC) was precisely 50 basis points. The 50 basis point adjustment was not based on any calculations or modelling. Rather, the AER selected an estimate of 6.5% "having regard to the desirability of regulatory certainty and stability."[9] Moreover, the 50 basis point increase is a relatively small adjustment given that almost all financial indicators of risk were at their highest levels for decades. For these reasons, it is my view that the 6.5% estimate should not be treated as any sort of theoretical or empirical maximum upper bound for MRP estimates.

[8] WACC Review Final Decision, p. 238.
[9] WACC Review Final Decision, p. 238.

3. Time horizon and method of averaging

AER estimate is based, in part, on geometric averages

21. In its four recent final decisions, the AER sets out its view that a 10-year horizon is appropriate when estimating MRP:

> the AER considers it appropriate to calculate the MRP with the assumption of a 10 year investment horizon.[10]

22. Presumably this means that, when estimating MRP, one should think about the average annual return over a 10-year period that investors would require from an equity investment in the average firm.

23. The recent final decisions then link this 10-year horizon with the method of averaging that should be applied to historical data when estimating MRP:

> arithmetic mean estimates of realised annual excess returns are likely to overstate realised excess returns over a 10 year time horizon because they do not take account of the cumulative effect of returns over a 10 year time horizon.[11]

and

> the AER notes that the arithmetic means of historical excess returns are likely to be overstated to some degree. The best estimate of historical excess returns over a 10 year period is likely to be somewhere between the geometric mean and the arithmetic mean of annual excess returns.[12]

24. In this context, an arithmetic average is computed by adding the observations over the sample period and then dividing by the number of observations:

$$\text{Arithmetic Average} = \frac{r_1 + r_2 + \ldots + r_N}{N}$$

whereas a geometric average is computed as:

$$\text{Geometric Average} = \left[\left(1 + r_1\right) \times \left(1 + r_2\right) \times \ldots \times \left(1 + r_N\right)\right]^{1/N} - 1.$$

[10] Amadeus Final Decision, p. 151; Allgas Qld Final Decision, p. 122; Envestra Qld Final Decision, p. 173; SA Final Decision, p. 185.
[11] Amadeus Final Decision, p. 153; Allgas Qld Final Decision, p. 127; Envestra Qld Final Decision, p. 178; SA Final Decision, p. 190.
[12] Amadeus Final Decision, pp. 153-154; Allgas Qld Final Decision, p. 128; Envestra Qld Final Decision, p. 179; SA Final Decision, p. 191.

25. The recent final decisions do not state precisely how the AER used arithmetic and geometric averages of historical excess returns data – other than to suggest that the best estimate of MRP for a 10-year horizon is likely to be somewhere between the arithmetic and geometric averages and that:

> the point estimates calculated on both an arithmetic and a geometric mean basis are still relevant and should inform the best estimate of the MRP.[13]

No reliance should be placed on geometric averages

26. It is wrong to place *any* reliance on geometric averages. To the extent that reliance is (incorrectly) placed on geometric averages, the resulting estimate of MRP will be downwardly biased.

27. The issue of whether historical estimates of MRP (for use in the CAPM) should be based on arithmetic or geometric averages is dealt with in detail in the well-known Harvard Business School case relating to Marriott Corporation.[14] The instructor solutions to that case note that it is the *expected* annual return that is relevant when estimating MRP and that:

> Students focusing on the geometric average will argue that it is the appropriate growth rate of an investment…However, the arithmetic average is a better measure of the *expected* return on an investment.

28. The instructor solutions are quite clear about which approach should be used to estimate MRP:

> The arithmetic average annual return is the correct measure of the expected annual return.

29. The solutions go on to explain that:

> Suppose, for example, that a two-period investment has two equally likely outcomes: a 40% return or a -20% return. The average returns are:
>
> $$\text{Arithmetic Average} = \frac{40 + (-20)}{2} = 10\%$$
>
> $$\text{Geometic Average} = \sqrt{1.40 \times 0.80} - 1 = 5.8\%$$
>
> To see that the arithmetic average is the correct measure of expected return, compute the return associated with each possible outcome. Assume that $1,000 is invested and that

[13] Amadeus Final Decision, p. 153; Allgas Qld Final Decision, p. 127; Envestra Qld Final Decision, p. 178; SA Final Decision, p. 190.

[14] The Harvard Business School case series is highly regarded and frequently used in top-ranking business schools and executive education programs. The Marriott Case was developed by Prof. Richard Ruback of Harvard Business School. It is widely used in graduate business programs globally. The Marriott Case uses the CAPM to estimate the required return on equity.

> the returns conform to the expected frequency distribution [i.e., half the time the return will be 40% and half the time it will be -20%].

Year	0	1	2	Terminal value	Probability
	1000	40%	40%	1,960	0.25
	1000	40%	-20%	1,120	0.25
	1000	-20%	40%	1,120	0.25
	1000	-20%	-20%	640	0.25
Probability-weighted average				1,210	

> Thus, the expected return is the arithmetic average return: $1{,}000 \times (1.10)^2 = 1{,}210$.

30. The Harvard case solutions also contain a more detailed example that considers a 10-year time horizon. It is clear about the fact that even with a 10-year time horizon, the arithmetic average must be used. Not the geometric average. Not something between the arithmetic and geometric averages.

31. Suppose the goal is to estimate an expected annual return over the next 10-years, consistent with the AER view. To see why the expected annual (compound) return is the arithmetic average, continue the previous example where there is a 50/50 chance of the return being 40% or -20% over the course of a year. In the context of historical data, suppose a sample period of 50 years was used and that in 25 of those years there was a return of 40% and in 25 of them there was a return of -20%. In this case:

    a) the arithmetic average return is 10% p.a.; and

    b) the geometric average return is 5.83%.

32. Now the question is: if stock market returns over the next 10 years occur with the same relative frequency as they did over the last 50 years, what annual compound return should we expect over the next 10 years?

33. This question can be answered by examining the outcome of every possible sequence of returns over the next 10 years and by determining the probability of each. For example, it is possible that the return will be 40% in every one of the 10 years and the value of an initial investment of $100 will accumulate to:

$$100 \times (1.40)^{10} = 2{,}892.55.$$

34. However, the probability of 10 "good" years in a row is only 0.1% (the same as the chance of tossing a coin 10 times and getting 10 heads).

35. Similarly, if the next 10 years produces nine with a 40% return and one with a -20% return, the accumulated value of a $100 investment will be:

$$100 \times (1.40)^9 \times (0.80)^1 = 1{,}652.88.$$

36. The probability of this occurring is approximately 1% (which is 10 times higher than in the previous case, since the -20% return could be in any one of 10 positions – Year 1 or Year 2, and so on). Note that this is the same as the probability of getting 9 heads out of 10 coin tosses.

37. All of the possible outcomes, and the probability of each occurring, are set out in Table 1 below.

Table 1. Probability distribution of potential investment payoffs

Number of 40% years	Number of -20% years	Probability	Accumulated value	Average compound annual return
10	0	0.0010[1]	2,892.55	40.00%
9	1	0.0098[2]	1,652.88	32.38%
8	2	0.0439[3]	944.50	25.18%
7	3	0.1172	539.72	18.36%
6	4	0.2051	308.41	11.92%
5	5	0.2461	176.23	5.83%
4	6	0.2051	100.71	0.07%
3	7	0.1172	57.55	-5.38%
2	8	0.0439	32.88	-10.53%
1	9	0.0098	18.79	-15.40%
0	10	0.0010	10.74	-20.00%
Expected payoff			259.37	

1. There is only one possible sequence of 10 "good" years, so $(0.5)^{10} = 0.0010$.

2. The one "bad" year can occur in any one of the 10 positions, so $10(0.5)^9(0.5)^1 = 0.0098$.

3. The two "bad" years can occur in any combination of the 10 years. There are 45 unique sequences that involve two bad years out of 10 – spots 1 and 2, spots 1 and 3, and so on. Therefore the probability is $45(0.5)^8(0.5)^2 = 0.0439$. The remaining probabilities are determined accordingly.

38. The *expected* accumulated value (at the end of 10 years) is $259.37. Note that this implies an annual return of 10% (which is precisely the arithmetic average):

$$100 \times (1.10)^{10} = 259.37.$$

39. Hence, if the relevant question is:

> if stock market returns over the next 10 years occur with the same frequency as they did over the last 50 years, what annual compound return should we expect over the next 10 years?

which it is, the answer is the arithmetic average return – which in this case is 10%.

40. The mistake that is made by using the geometric average is to confuse the *expected* return with the return from the *median* scenario. Note that the annual return from the median (middle-ranked) scenario is 5.83% – the geometric mean. The MRP in the CAPM is an *expected* return, not a *median* return. Consequently, the arithmetic mean, and not the geometric mean *must* be used.

Conclusion

41. To the extent that the AER has relied on geometric mean estimates in its recent final decisions, it is in error and its estimates must be corrected upwards to what they would have been had there been no reliance on geometric means.

Recent comments by Australian Competition Tribunal

Context

42. In the recent Envestra MRP Case, the Tribunal noted that it did not need to decide the arithmetic vs. geometric mean issue, but indicated that it would make "some comments."[15] The Tribunal then made no formal conclusion on the issue, stating that:

> The material before the Tribunal in this matter does not allow it to decide this issue. Rather, it is a matter that the AER should consider in consultation with service providers and other interested parties.[16]

Geometric mean is less than arithmetic mean

43. In its consideration of arithmetic and geometric means, the Tribunal begins by noting that:

> It is the AER's view, with which the Tribunal agrees, that the cumulative return across a period greater than one year will be less that the average of yearly returns.[17]

44. This statement is obviously incorrect, and can be shown to be so via a simple example. Consider a portfolio worth 100 that increases to 200 over the first year and then deceases to 180 over the second year. This portfolio has returns of 100% and -10% in each of the two years. The average return is 45%[18] and the cumulative return across the period is 80%, which is obviously *higher* than the average of the yearly returns.

45. What the Tribunal apparently meant to say was that the geometric mean return across a period of greater than one year will be less than the arithmetic mean of the yearly returns across the same period. This is well known to be true in all cases but for the special case where all of the yearly

[15] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 147.
[16] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 155.
[17] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 150.
[18] (100% + -10%)/2.

returns are equal. Moreover, it is also well known that the difference between the arithmetic and geometric means increases with the volatility of the annual returns.

Use of 10-year time horizon

46. In the recent Envestra MRP case, the Tribunal stated that the AER itself has:

> noted that the arithmetic mean of 10-year historical excess returns would likely be an unbiased estimator of a forward-looking 10-year return, the appropriate benchmark.[19]

47. That is, the AER is of the view that if it had available sufficient non-overlapping 10-year historical periods it would take the arithmetic average of those 10-year periods as an estimate of the expected return over the next 10-year period. I agree that this would be entirely appropriate.

48. Of course, having obtained the arithmetic average of many non-overlapping 10-year periods (if there were a sufficient number of such periods), the AER would have to convert this back to an equivalent one-year return because an annualised WACC is ultimately required. For example, suppose the arithmetic average of a large number of 10-year periods turned out to be 79%. The AER would need to estimate the annual value that would compound up to 79% over 10 years as:

$$\begin{aligned} MRP_{annual} &= \left(1 + MRP_{10-years}\right)^{1/10} - 1 \\ &= \left(1.79\right)^{1/10} - 1 = 6\%. \end{aligned}$$

49. In my view, the matters set out in this sub-section are not the subject of any debate.

Tribunal example

50. The Tribunal has recently made some comments about the use of geometric and arithmetic means in the process of estimating market risk premium. In particular, the Tribunal notes that for any particular historical period, the geometric mean will be less than the arithmetic mean, except for the case where the return is constant over the period, in which case the two means will be equal.

51. The Tribunal then presents a simple example of a case where the geometric mean is less than the arithmetic mean:

> imagine a portfolio that is worth 100 at the beginning of year one. Suppose that in year one the portfolio falls to 80, a -20% return, before returning to 100 in year two. The cumulative two year return is zero, whereas the average annual return is (-0.2+0.25)/2=2.5%.[20]

52. An individual who invested $100 in this portfolio at the beginning of the two-year period has clearly earned a zero return over the two years. There is obviously no dispute about this. The backward-

[19] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 150.
[20] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 150.

looking historical compound annual growth rate (**CAGR**) is computed as the geometric mean of a particular series of historical annual returns. But that is not the relevant question in terms of estimating the MRP to apply to a forward-looking period.

53. To see this, consider the following example which is based on the Tribunal's illustration above. Suppose that there is a portfolio whose return is either -20% or +25% every year – these are the only two possible returns. Also suppose that we want to estimate the expected return over the next two years. The AER has stated, and I agree, that an appropriate way to estimate the forward-looking two-year return would be to take the arithmetic average of a sample of historical two-year returns.

54. For this portfolio, there are four possible combinations of two-year returns as set out in Table 2 below.

Table 2. Possible sequences of two-year returns in Tribunal example

Year	1	2
	25%	25%
	25%	-20%
	-20%	25%
	-20%	-20%

55. If the returns are serially independent, then these four possible outcomes are equally likely to occur. If we had eight years of historical data, for example, we would, on average, obtain one of each of the four outcomes above, as shown in Table 3 below.

Table 3. Historical sequences of two-year returns in Tribunal example

Year	1-year return	2-year return
1	25	
2	25	56.25
3	25	
4	-20	0
5	-20	
6	25	0
7	-20	
8	-20	-36
Arithmetic mean	2.5	5.0625

56. In this case, we have eight observations of historical 1-year returns. The AER view, with which I agree, is that it would agree that if we were seeking to obtain an estimate of the 1-year forward-looking return it would be appropriate to use the 1-year arithmetic mean of 2.5%.

57. Similarly, we have four observations of historical 2-year returns. Again, it would be appropriate to use the arithmetic mean of those two-year returns as an estimate forward-looking 2-year return. This would be 5.0625% per two-years. Expressing this return in an annualised manner yields 2.5% p.a. since:

$$(1.025)^2 - 1 = 5.0625\%.$$

58. That is, whether we have a time horizon of one or two years, the expected return is the same – 2.5% p.a.

59. Of course, the same would apply again if we had a 3-year time horizon. In this case there would be eight possible sequences of returns, all of which would be equally likely to occur, as set out in Table 4 below.

Table 4. Historical sequences of three-year returns in Tribunal example

Year	1-year return	3-year return
1	25	
2	25	
3	25	95.3125
4	25	
5	25	
6	-20	25
7	25	
8	-20	
9	25	25
10	25	
11	-20	
12	-20	-20
13	-20	
14	25	
15	25	25
16	-20	
17	25	
18	-20	-20
19	-20	
20	-20	
21	25	-20
22	-20	
23	-20	
24	-20	-48.8
Arithmetic Mean	**2.5**	**7.69**

60. In this case, the average 3-year historical return is 7.69% per 3-years, which is equivalent (again) to 2.5% p.a.:

$$(1.025)^3 - 1 = 7.69\%.$$

61. In summary, the annualised forward-looking expected return is independent of the time horizon that is being examined. Whether the forward-looking horizon is one, two, three or ten years, the expected return is 2.5% p.a. There is no such thing as a different expected return depending upon the time horizon.

62. Nowhere in the literature or in practice does anyone report a term structure of MRP estimates, with different estimates depending upon the time horizon of investors. It is only the AER that claims that there is a link between the time horizon and the estimate of MRP, and that this occurs in a way that somehow makes the geometric mean relevant.

4. Grossing up for the assumed value of imputation credits

63. In the recent final decisions[21] the estimates of MRP from historical stock return data have been "grossed up" to reflect the assumed value of theta of 0.35. It is correct to gross up estimates of MRP to reflect the assumed value of imputation credits to ensure internal consistency between the estimate of MRP and the estimate of gamma.

64. The total return on equity consists of three components – dividends, capital gains and dividend imputation franking credits. The stock index data that forms the basis of the historical data used to estimate MRP reflects only dividends and capital gains. Consequently, the assumed value of franking credits must be added to the historical MRP estimate via a procedure known as "grossing up."

65. The grossing up calculations were performed for the AER by Associate Professor Handley. I have no reason to doubt those calculations, but note that the details of those calculations have not been made public.

[21] Amadeus Final Decision, p. 154; Allgas Qld Final Decision, p. 128; Envestra Qld Final Decision, p. 179; SA Final Decision, p. 191-192.

5. Qualitative information relied upon in recent AER decisions

Overview

66. In its four recent final decisions, the AER has made use of two types of qualitative information in its considerations of MRP:

    a) Survey responses and market practice; and

    b) Macroeconomic commentary.

67. In this section, I set out my views about how this qualitative information should be interpreted and about how much weight should be afforded to it.

Survey responses

68. In its recent final decisions, the AER concludes that:

> survey based estimates of the MRP are relevant for consideration along with the range of other evidence on the MRP.[22]

69. Surveys can be useful when asking questions about what people actually do (e.g., whether or not their company regularly uses the CAPM to estimate the required return on equity). However, questions about what people think might happen in the future (e.g., how much the stock market might go up over some future period) are of very limited use.

70. Moreover, the AER's recent final decisions do not state *how* the AER used the survey evidence in reaching its conclusion about MRP, nor do they even set out *what* estimate the AER thinks is supported by the survey evidence.

71. The recent final decisions are also unclear about whether the AER has made any adjustment to survey estimates of MRP to reflect the assumed value of franking credits. The survey estimates of MRP reflect no value for franking credits, whereas the AER has adopted a value of theta of 0.35. To create a like-with like comparison, estimates of MRP that are ex-franking credits must be adjusted for the AER's assumed value of franking credits. In this regard, the final decisions state the AER's view that:

> the estimation of MRP is imprecise and it may not be appropriate to explicitly adjust survey based estimates of the MRP for an assumed theta value that is as low as 0.35.[23]

[22] Amadeus Final Decision, p. 161; Allgas Qld Final Decision, p. 137; Envestra Qld Final Decision, p. 188; SA Final Decision, p. 200.
[23] Amadeus Final Decision, p. 161; Allgas Qld Final Decision, p. 137; Envestra Qld Final Decision, p. 188; SA Final Decision, p. 200.

72. It is not clear whether the AER made any adjustment for the assumed value of franking credits (as they should have), what value of MRP they believe the survey evidence supports, or how they used that information in determining their final estimate of MRP.

Observed market prices vs. macroeconomic commentary

73. The four recent final decisions note that the AER has placed some reliance on various pieces of macroeconomic commentary:

> The economic and financial markets outlook for Australia is robust as noted in statements by the Reserve Bank of Australia (RBA), the International Monetary Fund (IMF) and the Organisation for Economic Co-operation and Development (OECD). This is likely to be factored into investors' expectations of future equity market returns and therefore the MRP required by investors.[24]

74. However, the final decisions are unclear about how much weight the AER has applied to this macroeconomic commentary or what estimate of MRP it believes the commentary supports.

75. This commentary is indirect evidence at best and should be afforded little weight in comparison to observed market data. No other WACC parameters are estimated with reference to commentary. Presumably this commentary also touches on the issue of interest rates, but the risk free rate is estimated from market prices without reference to any commentary.

76. Moreover, there is a distinction between forecasts of macroeconomic conditions and the prevailing conditions in the market for funds. More direct evidence about the current conditions in the market for funds can be obtained from current prices in the market for funds, than from the text of various pieces of macroeconomic commentary.

Recent comments from Tribunal

77. The Tribunal has recently had regard to the use of qualitative evidence such as survey responses and general macroeconomic commentary. In relation to surveys, the Tribunal noted that survey evidence on which the AER has sought to rely has been criticised for not providing a sufficient real world context to give the survey results any real meaning and concluded that:

> Surveys must be treated with great caution when being used in this context. Consideration must be given at least to the types of questions asked, the wording of those questions, the sample of respondents, the number of respondents, the number of non-respondents and the timing of the survey. Problems in any of these can lead to the survey results being largely valueless or potentially inaccurate.

[24] Envestra Qld Final Decision, p. 47; SA Final Decision, p. 52.

> When presented with survey evidence that contains a high number of non-respondents as well as a small number of respondents in the desired categories of expertise, it is dangerous for the AER to place any determinative weight on the results.[25]

78. In relation to general macroeconomic commentary, the Tribunal has drawn a clear distinction between general economic forecasts and estimation of market risk premium noting that no case has been made for quantitatively linking the two. The Tribunal has concluded that:

> It is not appropriate for the AER to infer from generally positive economic forecasts conclusions as to the likely MRP. These reports are not intended to provide forecasts of equity returns. Further, the reports do not endeavour to address the extent of correlation between economic performance and equity risk. This correlation would need to be explicitly dealt with, either by the forecasting bodies, the AER or expert evidence, before these reports could be usefully or validly employed to assist in forecasting the MRP.[26]

Conclusions in relation to qualitative information

79. In my view, the best information about the prevailing conditions in the market for funds comes from traded prices drawn from the market for funds, rather than from survey responses or macroeconomic commentary. Consequently, I give no material weight to this qualitative information. I note that this view is consistent with the recent comments of the Tribunal.

[25] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.
[26] Application by Envestra Ltd (No 2), ACompT 3, Paragraph 158.

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Appendix: CV of Prof Stephen Gray

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Academic Qualifications

1995 Ph.D. (Finance), Graduate School of Business, Stanford University.
Dissertation Title: Essays in Empirical Finance
Committee Chairman: Ken Singleton
1989 LL.B. (Hons), Bachelor of Laws with Honours, University of Queensland.
1986 B.Com. (Hons), Bachelor of Commerce with Honours, University of Queensland.

Employment History

2000-Present Professor of Finance, UQ Business School, University of Queensland.
1997-2000 Associate Professor of Finance, Department of Commerce, University of Queensland and Research Associate Professor of Finance, Fuqua School of Business, Duke University.
1994-1997 Assistant Professor of Finance, Fuqua School of Business, Duke University.
1990-1993 Research Assistant, Graduate School of Business, Stanford University.
1988-1990 Assistant Professor of Finance, Department of Commerce, University of Queensland.
1987 Specialist Tutor in Finance, Queensland University of Technology.
1986 Teaching Assistant in Finance, Department of Commerce, University of Queensland.

Academic Awards

2006 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
2002 Journal of Financial Economics, All-Star Paper Award, for Modeling the Conditional Distribution of Interest Rates as a Regime-Switching Process, JFE, 1996, 42, 27-62.
2002 Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000 University of Queensland Award for Excellence in Teaching (a University-wide award).
1999 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.
1999 KPMG Teaching Prize, Department of Commerce, University of Queensland.
1998 Faculty Teaching Prize (Business, Economics, and Law), University of Queensland.
1991 Jaedicke Fellow in Finance, Doctoral Program, Graduate School of Business, Stanford University.
1989 Touche Ross Teaching Prize, Department of Commerce, University of Queensland.
1986 University Medal in Commerce, University of Queensland.

Large Grants (over $100, 000)

- Australian Research Council Linkage Grant, 2008—2010, Managing Asymmetry Risk ($320,000), with T. Brailsford, J.Alcock, and Tactical Global Management.
- Intelligent Grid Cluster, Distributed Energy – CSIRO Energy Transformed Flagship Collaboration Cluster Grant, 2008-2010 ($552,000)
- Australian Research Council Research Infrastructure Block Grant, 2007—2008, Australian Financial Information Database ($279,754).

- Australian Research Council Discovery Grant, 2006—2008, Capital Management in a Stochastic Earnings Environment ($270,000).
- Australian Research Council Discovery Grant, 2005—2007, Australian Cost of Equity.
- Australian Research Council Discovery Grant, 2002—2004, Quantification Issues in Corporate Valuation, the Cost of Capital, and Optimal Capital Structure.
- Australian Research Council Strategic Partnership Grant, 1997—2000, Electricity Contracts and Securities in a Deregulated Market: Valuation and Risk Management for Market Participants.

Current Research Interests

Benchmark returns and the cost of capital. Corporate Finance. Capital structure. Real and strategic options and corporate valuation. Financial and credit risk management. Empirical finance and asset pricing.

Publications

Gray, S. and J. Hall, (2012), "Unconstrained estimates of the equity risk premium" *Review of Accounting Studies,* forthcoming.

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Teaching

Fuqua School of Business, Duke University, Student Evaluations (0-7 scale):

- Financial Management (MBA Core): Average 6.5 over 7 years.
- Advanced Derivatives: Average 6.6 over 4 years.
- Empirical Issues in Asset Pricing: Ph.D. Class

1999, 2006 Outstanding Professor Award, Global Executive MBA, Fuqua School of Business, Duke University.

UQ Business School, University of Queensland, Student Evaluations (0-7 scale):

- Finance (MBA Core): Average 6.6 over 10 years.
- Corporate Finance Honours: Average 6.9 over 10 years.

2002 Australian University Teaching Award – Business (a national award for all university instructors in all disciplines).
2000 University of Queensland Award for Excellence in Teaching.
1999 Department of Commerce KPMG Teaching Prize, University of Queensland.
1998 Faculty Teaching Prize, Faculty of Business Economics and Law, University of Queensland.
1998 Commendation for Excellence in Teaching, University-wide Teaching Awards, University of Queensland.
1989 Touche Ross Teaching Prize, Department of Commerce, University of Queensland.

Board Positions

2002 - Present: Director, Financial Management Association of Australia Ltd.
2003 - Present: Director, Moreton Bay Boys College Ltd. (Chairman since 2007).
2002 - 2007: External Risk Advisor to Board of Enertrade (Queensland Power Trading Corporation Ltd.)

Consulting

Managing Director, Strategic Finance Group: www.sfgconsulting.com.au.

Consulting interests and specialties, with recent examples, include:

- **Corporate finance**
  - ⇒ **Listed multi-business corporation:** Detailed financial modeling of each business unit, analysis of corporate strategy, estimation of effects of alternate strategies, development of capital allocation framework.

- **Capital management and optimal capital structure**
  - ⇒ **State-owned electricity generator:** Built detailed financial model to analyze effects of increased leverage on cost of capital, entity value, credit rating, and stability of dividends. Debt of $500 million issued.

- **Cost of capital**
  - ⇒ **Cost of Capital in the Public Sector:** Provided advice to a government enterprise on how to estimate an appropriate cost of capital and benchmark return for Government-owned enterprises. Appearance as **expert witness** in legal proceedings that followed a regulatory determination.
  - ⇒ **Expert Witness:** Produced a written report and provided court testimony on issues relating to the cost of capital of a cable TV business.
  - ⇒ **Regulatory Cost of Capital:** Extensive work for regulators and regulated entities on all matters relating to estimation of weighted-average cost of capital.

- **Valuation**
  - ⇒ **Expert Witness:** Produced a written report and provided court testimony. The issue was whether, during a takeover offer, the shares of the bidding firm were affected by a liquidity premium due to its incorporation in the major stock market index.
  - ⇒ **Expert Witness:** Produced a written report and provided court testimony in relation to valuation issues involving an integrated mine and refinery.

- **Capital Raising**
  - ⇒ Produced comprehensive valuation models in the context of capital raisings for a range of businesses in a range of industries including manufacturing, film production, and biotechnology.

- **Asset pricing and empirical finance**
  - ⇒ **Expert Witness:** Produced a written report on whether the client's arbitrage-driven trading strategy caused undue movements in the prices of certain shares.

- **Application of econometric techniques to applied problems in finance**
  - ⇒ **Debt Structure Review:** Provided advice to a large City Council on restructuring their debt portfolio. The issues involved optimisation of a range of performance measures for each business unit in the Council while simultaneously minimizing the volatility of the Council's equity in each business unit.
  - ⇒ **Superannuation Fund Performance Benchmarking:** Conducted an analysis of the techniques used by a large superannuation fund to benchmark its performance against competing funds.

- **Valuation of derivative securities**
  - ⇒ **Stochastic Volatility Models in Interest Rate Futures Markets:** Estimated and implemented a number of models designed to predict volatility in interest rate futures markets.

- **Application of option-pricing techniques to real project evaluation**
  - ⇒ **Real Option Valuation:** Developed a framework for valuing an option on a large office building. Acted as arbitrator between the various parties involved and reached a consensus valuation.
  - ⇒ **Real Option Valuation:** Used real options framework in the valuation of a bio-tech company in the context of an M&A transaction.