# Estimating gamma for regulatory purposes

*Report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausnet Services Directlink, Networks NSW (Ausgrid, Endeavour Energy and Essential Energy), Citipower, Powercor, ENERGEX, Ergon, SA Power Networks, Australian Gas Networks and United Energy*

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# 1. Background and conclusions

## Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausnet Services, Directlink, Networks NSW (Ausgrid, Endeavour Energy and Essential Energy), Citipower, Powercor, ENERGEX, Ergon, SA Power Networks, Australian Gas Networks and United Energy to provide our views on the estimation of the gamma parameter in the context of regulatory weighted average cost of capital (**WACC**) estimation.

2. This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of SFG Consulting, a specialist corporate finance consultancy. I have Honours degrees in Commerce and Law from the University of Queensland and a PhD in Financial Economics from Stanford University. I teach graduate level courses with a focus on cost of capital issues, I have published widely in high-level academic journals, and I have more than 15 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. A copy of my curriculum vitae is attached as Appendix 2 to this report.

3. My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above.

4. I have been asked to provide my views on the material in the following documents that relates to the estimation of the gamma parameter:

    a) The recent draft decisions published by the Australian Energy Regulator (**AER**) for Ausgrid, Directlink, Essential Energy, Endeavour Energy, TransGrid, Jemena Gas Networks and ActewAGL; and

    b) Handley (2014), a consultant report commissioned by the AER; and

    c) McKenzie and Partington (2013 QRC), a consultant report commissioned by the Queensland Resources Council for submission to the Queensland Competition Authority.

5. I have regard to other published and publicly available material as indicated throughout this report.

6. My instructions are set out in Appendix 1 to this report.

7. I have read, understood and complied with the Federal Court of Australia Practice Note CM7 *Expert Witnesses in Proceedings in the Federal Court of Australia.*

## Summary of conclusions

### The interpretation of theta

8. The AER's position is that theta (and consequently gamma) no longer represents the value (as in "worth" or "market value to investors"), but now represents the proportion of credits that are likely to be redeemed. The AER is not saying that it has identified a number of approaches for estimating the value (as in "worth to investors in the market") of imputation credits. Rather, the AER considers:

    a) Some approaches for estimating the value (as in "worth to investors in the market") of imputation credits – the market value studies; and

b) Some approaches for estimating the redemption rate – the equity ownership and ATO tax statistic approaches.

9. The AER considers that the market value studies are inconsistent with its conceptual definition of theta,[1] because they estimate the market value of credits rather than the redemption rate, and that the redemption rate methods are consistent with its conceptual definition of theta.

### Consistent estimation methods

10. Having determined which of the conceptual definitions of theta is to be adopted, the corresponding estimation techniques must then be employed:

a) If theta is to be interpreted as the value of distributed credits, then it must be estimated using empirical techniques that are designed to estimate the value of distributed credits; and

b) If theta is to be interpreted as the proportion of credits that are redeemed, then it must be estimated using empirical techniques that are designed to estimate the proportion of credits that are redeemed.

11. The AER proposes two techniques for estimating the proportion of credits that are redeemed:

a) The equity ownership approach – an estimate of the proportion of Australian shares that are owned by resident investors; and

b) ATO tax statistics – an estimate of the ratio of redeemed credits to distributed credits,

and it estimates theta using those approaches.

### Why theta must have a value (as in "worth to investors") interpretation

12. Under the building block approach, the regulator makes an estimate of gamma and then reduces the return that is available to investors from dividends and capital gains from the firm accordingly. In my view, it is clear that this is consistent with a *value* interpretation. If the *value* of foregone dividends and capital gains is greater than the *value* of received imputation credits, the investors will be left under-compensated, and vice versa.

13. For other WACC parameters, a market value interpretation is applied and traded market prices are used to estimate value (as in "worth to investors"). For example, when estimating beta, the AER uses traded stock prices, which reflect the value of those shares to investors, when estimating the cost of debt the AER uses traded bond prices which reflect the value of those bonds to investors, and so on. More specifically, the share prices that the AER uses to estimate other WACC parameters reflect the extent to which investors *value* dividends, capital gains and imputation credits. They do not reflect the extent to which investors *value* dividends and capital gains plus the extent to which they might be able to *redeem* imputation credits.

### The AER's rationale for adopting a redemption rate interpretation

14. The main basis for the AER's adoption of a redemption rate interpretation of theta is that:

a) It is justified by a representative investor equilibrium framework; and

[1] AER Rate of Return Guideline, Explanatory Statement, p. 176.

b) It is supported by advice from its consultants.

15. I disagree with both of these conclusions and set out detailed reasons to explain why.

### Estimates of the value of distributed credits

16. In my previous report to the AER,[2] I submitted that:

> In all of the alternative market value studies over the last five years, the authors have concluded that the evidence supports an estimate of theta between 0 and 0.35.[3] We note that, relative to these alternative market value studies, dividend drop-off analysis has a longer history, has been subjected to a higher level of scrutiny (especially the SFG 2011 study), and the strengths and weaknesses of the approach, and the econometric issues, are better understood. Consequently, we maintain a theta estimate of 0.35 – from dividend drop-off analysis – in this report noting that this is a conservative estimate in that the other relevant evidence produces lower estimates.[4]

17. I remain of the view that 0.35 is a conservative estimate of the market value of distributed imputation credits for the reasons set out in this report and my earlier report.

### Estimates of the redemption rate

18. As set out above, I consider that estimates of the redemption rate are not estimates of theta. However, I have considered the AER's proposed equity ownership and tax statistic estimates of the redemption rate. My view is that the AER's equity ownership estimates are overstated in that:

a) The AER adopts a range that is above that which is supported by the data; and

b) The AER's estimate is inflated by reliance on outdated data.

### Estimates of the distribution rate

19. The AER's rate of Return Guideline adopted the "widely accepted" estimate of 0.7 for the distribution rate parameter. All service providers who have submitted since the Guideline have accepted the Guideline estimate of 0.7. Now, in a series of draft decisions, the AER has departed from its Guideline estimate by expanding the range for the distribution rate to 0.7-0.8 based on:

a) An analysis from Handley (2014) that uses ATO data for listed firms; and

b) An estimate from Lally (2014 QCA) that is based on a methodology that he has espoused for over 10 years and which was rejected by the AER in its 2013 Guideline.

20. My view is that:

a) The best estimate of the distribution rate for the benchmark efficient entity from the Handley (2014) and Lally (2014 QCA) analysis (which considers listed firms only) is not materially different from the "widely accepted" estimate of 70%;

[2] SFG (2014 Gamma).
[3] See, for example, the list of studies set out in AER Rate of Return Guideline, Explanatory Statement, Appendix H, Table H.8, pp. 173-174.
[4] SFG (2014 Gamma), p. 38.

b) That estimate is over-stated to the extent that foreign-sourced income enables large public companies to distribute a higher proportion of imputation credits because the benchmark efficient entity has no access to foreign-sourced income; and

c) The 80% estimate that the AER adopts for listed firms implicitly assumes that the benchmark efficient entity would be able to use foreign-sourced profits to enable it to distribute a higher proportion of foreign-sourced profits, when no such foreign-sourced profits would be available to it.

21. In my view, the "widely accepted" estimate of 70% is a conservative estimate of the distribution rate for the benchmark efficient entity and, for the reasons set out in the preceding paragraph, there is no reasonable basis to increase it to 0.8 even if the data is restricted to listed firms only.

### The best estimate of gamma

22. In my view, having regard to all of the issues considered in this report:

a) The best available estimate of the distribution rate is 0.7; and

b) The best available estimate of the value of distributed credits, theta, is 0.35,

in which case the best available estimate of gamma is 0.25.

## 2. The definition of theta

### Overview

23. Under Australia's dividend imputation tax system, dividends that are paid out of profits that have been taxed in Australia have imputation credits attached to them. A proportion of those credits will be redeemed against the domestic personal tax obligations of the shareholders who receive them. Credits distributed to non-resident shareholders cannot be redeemed against personal tax obligations and some credits distributed to resident investors are not redeemed due to particular provisions in the tax legislation[5] or due to the recipient not taking the active steps that are required for redemption.

24. Of course, only those credits that are distributed to investors (attached to dividends) can possibly be redeemed and consequently be of value to investors. For this reason, gamma is estimated as the product of two parameters:

$$\gamma = F \times \theta$$

where $F$ represents the distribution rate (the proportion of credits that are distributed to investors) and $\theta$ (**theta**) represents the value of a distributed imputation credit.[6]

25. The key point of contention is whether the second parameter, theta, should be defined as:

    a) The value of distributed credits; or

    b) The proportion of distributed credits that is likely to be redeemed by investors.

26. Some empirical methods have been developed to estimate the value of distributed credits, and these methods would be used if one determined that the relevant task was to estimate the value of imputation credits.

27. Other methods are available to estimate the proportion of distributed credits that might be redeemed, and these methods would be used if one determined that the relevant task was to estimate the redemption proportion.

28. In summary, the first task for any decision-maker is to determine whether theta (and consequently gamma) should be interpreted as the value of imputation credits or as the proportion of credits that might be redeemed. Once the interpretation of theta (and consequently gamma) has been settled, one would then apply the estimation methods that are consistent with that interpretation.

### The evolution of the AER's approach

#### The approach prior to the 2013 Guideline

29. Prior to the AER's 2013 Rate of Return Guideline it was uniformly accepted by regulators and all stakeholders that gamma represents the value (as in its usual meaning of "worth") of imputation credits to investors.

[5] For example, the 45-day rule prevents the redemption of credits in relation to shares held for fewer than 45 days around the ex-dividend date.

[6] This standard approach is also adopted in the Guideline. See the AER Rate of Return Guideline, p. 23. The Guideline refers to $F$ as the "payout ratio" and to theta as the "utilisation rate," but the AER's estimate of gamma is obtained by multiplying these two parameters, as set out here. Moreover, in its recent draft decisions the AER refers to $F$ as the distribution rate (throughout Attachment 4) and in places it refers to the second parameter as theta (e.g., Jemena Draft Decision, 3-86, 3-195, 3-199, 3-200, 3-207, 3-209, 3-231-233).

30. The way the regulatory framework operates is for the regulator to first determine the amount of dividends/capital gains that shareholders would require from the benchmark firm in the absence of imputation. Then the regulator estimates the value investors receive from imputation credits, and reduces the return from dividends/capital gains by that amount. That is, imputation credits are substituted for dividends/capital gains – leaving the overall return to investors unchanged.

31. For example, suppose the regulator estimates that, in the absence of imputation, investors would require a return of $100 from the benchmark firm. If imputation credits were considered to have a value of $10 to investors, then the allowed return to the firm would be reduced by $10 to $90. Thus, investors receive an allowed regulatory return from the firm of $90 and they receive imputation credits that are worth $10 to them, providing them with a total of $100, in accordance with the regulator's estimate of the total required return.

32. Australian regulators had uniformly adopted this approach with a "value" interpretation of gamma until the AER's 2013 Rate of Return Guideline.

### The AER's re-evaluation of the conceptual task

33. In its 2013 Guideline, the AER undertook what it described as a "re-evaluation of the conceptual task"[7] in relation to gamma. This has led the AER to now refer to theta as the "utilisation rate"[8] which is defined to be:

> The utilisation rate is the before-personal-tax reduction in company tax per one dollar of imputation credits that the representative investor receives. [9]

and:

> …the utilisation rate is the complex weighted average (by value and risk aversion) of individual investors' utilisation rates. In turn, these reflect each investor's expected ability to use imputation credits to reduce their tax (or get a refund). [10]

34. The AER goes on to conclude that taking an average weighted by risk-aversion would be difficult, given the data that is available. This leads to AER to re-define the "utilisation rate" without reference to risk-aversion:

> the utilisation rate, which is the extent to which investors can use the imputation credits they receive to reduce their personal tax.[11]

and:

> utilisation rates…reflect each investor's expected ability to use imputation credits to reduce their tax.[12]

[7] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[8] The AER still refers to this parameter as "theta" in some places in its Guideline materials and in its recent draft decisions. Thus, the AER appears to consider these two terms as being interchangeable.
[9] AER Rate of Return Guideline, Explanatory Statement, p. 165.
[10] AER Rate of Return Guideline, Explanatory Statement, p. 159, Footnote 530.
[11] AER Rate of Return Guideline, Explanatory Statement, p. 159.
[12] AER Rate of Return Guideline, Explanatory Statement, p. 159.

35. That is, the AER now defines the utilisation rate (theta) to be the simple proportion of distributed imputation credits that investors are able to redeem. This proportion is known as the "redemption rate" or the "redemption ratio." It is the ratio of redeemed credits to distributed credits – what proportion of the distributed credits is able to be redeemed.

### The recent draft decisions

36. In his recent report for the AER, Handley (2014) uses the term "utilisation value" when referring to imputation credits and the AER has adopted this term in places throughout its draft decisions.[13] The precise definition of this term is as follows:

> We define this utilisation value as the incremental reduction in personal tax, if any, which arises from the receipt of a franked dividend compared to the receipt of an otherwise equivalent unfranked dividend.[14]

37. That is, the term "utilisation value" is equivalent to the term "redemption rate" or the "proportion of credits that is redeemed." The term "utilisation value" does not refer to the market value that investors obtain by utilising (or redeeming) their credits.

38. In summary:

    a) Prior to the Guideline, the AER adopted the value (as in "worth to investors") interpretation of gamma and sought to estimate the market value of credits; and

    b) The AER now adopts a redemption rate (or "utilisation") interpretation of gamma and seeks to estimate the redemption rate.

## The AER still adopts a redemption rate interpretation of theta

39. The AER's recent draft decisions can give the impression that it may have reverted back to its previous "value" interpretation of theta. For example, the AER states that:

> …we consider the 'value of imputation credits' to be the value of imputation credits to investors in the benchmark efficient entity,[15]

and

> The question is then how to interpret and estimate the value of imputation credits.[16]

40. However, in its recent draft decisions, the AER clearly states that (a) it has not changed its interpretation of theta since the Guideline[17] and (b) it considers market value studies to provide an inappropriate estimate of theta.[18] In its Guideline materials, the AER notes that the Rules state that:

[13] See, for example, Jemena Draft Decision, Attachment 4, pp. 12, 17, 35, 36, 43.
[14] Handley and Maheswaran (2008), p. 84.
[15] Jemena Draft Decision, Attachment 4, p. 34.
[16] Jemena Draft Decision, Attachment 4, p. 34.
[17] Jemena Draft Decision, Attachment 4, p. 35.
[18] AER Rate of Return Guideline, Explanatory Statement, p. 176.

> $\gamma$ is the value of imputation credits,[19]

and goes on to conclude that there are two potentially valid interpretations of the meaning of "value" in this context:

a) "Value" might be interpreted as "market value,"[20] which would be in accordance with the uniform interpretation of gamma in every regulatory determination in the country prior to the AER's Guideline; or

b) "Value" might be interpreted as the "the number that a particular parameter takes (that is, its numerical value)."[21]

41. The AER stated that "[t]he market valuation is one such interpretation," but that it had adopted the other "potentially valid" interpretation.[22]

42. That is, the AER's position is that theta (and consequently gamma) no longer represents the value (as in "worth" or "value to investors in the market"), but now represents the proportion of credits that is likely to be redeemed. The AER then estimates the redemption rate, which it interprets as being consistent with the specific reference to "value" in the Rules in that it is "the number that is adopted" for imputation credits.

43. In my view, this is a very important point. The AER is not saying that it has identified a number of different approaches for estimating the value (as in "worth to investors in the market") of imputation credits. Rather, the AER considers:

a) Some approaches for estimating the value (as in "worth to investors in the market") of imputation credits – the market value studies; and

b) Some approaches for estimating the redemption rate – the equity ownership and ATO tax statistic approaches.

44. The AER considers that the market value studies are inconsistent with its conceptual definition of theta,[23] because they estimate the market value of credits rather than the redemption rate, and that the redemption rate methods are consistent with its conceptual definition of theta.

### The Handley "personal costs" argument

*The personal costs argument is equivalent to defining theta to be the redemption rate*

45. In my previous report to the AER I provided a number of reasons why one would expect there to be a difference between the proportion of credits that is redeemed by investors and the value of those credits to investors.[24] Specifically, there are a number of costs that shareholders must bear in relation to imputation credits that they do not bear in relation to dividends and capital gains. SFG (2014 Gamma) contains several examples, and there may well be more. This is why the empirical evidence shows that shareholders value imputation credits at less than the face amount. This is also why the

[19] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).
[20] AER Rate of Return Guideline, Explanatory Statement, Appendices, p. 150.
[21] AER Rate of Return Guideline, Explanatory Statement, Appendices, p. 150.
[22] AER Rate of Return Guideline, Explanatory Statement, Appendices, p. 150.
[23] AER Rate of Return Guideline, Explanatory Statement, p. 176.
[24] SFG (2014 Gamma), pp. 13-15.

Tribunal ruled that redemption rates do not provide an estimate of the value of distributed credits, but only an upper bound.

46. The AER now states that these costs should be ignored when estimating theta:

> …the utilisation rate should reflect the before-personal-tax and before-personal-costs value of imputation credits to investors. Once these factors are excluded, an investor that is eligible to fully utilise imputation credits should value each dollar of imputation credits received at one dollar (that is, have a utilisation rate of 1). [25]

47. Of course, it is tautologically true that if one sets aside all of the reasons why investors in fact value credits at less than the face amount, one is left with theta representing the face amount. That is, this is really just another way of simply defining theta to be the redemption rate. The AER notes that there are a number of reasons why the value (as in "worth to investors") of imputation credits is less than the redemption rate. If all of these reasons are assumed to be immaterial or simply defined to be irrelevant, we end up back at the point where theta is defined to be the redemption rate.

*Personal costs are relevant to estimating theta – the same as all other WACC parameters*

48. The way the regulatory framework operates is for the regulator to first determine the amount of dividends/capital gains that shareholders would require from the benchmark firm in the absence of imputation. Then the regulator estimates the value investors receive from imputation credits, and reduces the return from dividends and capital gains by that amount. That is, imputation credits are substituted for dividends/capital gains.

49. If one assumes that imputation credits are taxed (at the personal level) at the same rate as dividends/capital gains, then personal taxes will be irrelevant because they will be applied symmetrically – an investor would have to pay the same amount of personal tax whether they received a dollar of imputation credits or a dollar of dividends/capital gains. This is why personal taxes are not considered here – they are a wash.

50. However, the situation is very different for the range of costs that are discussed in Attachment 4, Section A.7.2 of the recent draft decisions. They are costs that reasonable, efficient investors would incur in relation to imputation credits, which do not apply to dividends or capital gains. Thus, substituting a dollar of dividends/capital gains (which are immune from these costs) for a dollar of imputation credits (which incur these costs) leaves the investor worse off and under-compensated.

51. Handley (2014) asserts that because personal taxes are not relevant, "personal costs" are also not relevant. The error here is the implicit assumption that personal taxes are not relevant because they are "personal." However, the reason personal taxes are not relevant is because they are assumed to be symmetric between imputation credits and dividends/capital gains. By contrast, the "personal costs" are certainly not symmetric.

52. In my view, gamma is no different from any other WACC parameter in this respect. For example, when estimating beta, the AER uses traded stock prices, which reflect the value of those shares to investors. That value reflects any "personal costs" that the investors bear. There is no process of adjusting share prices to reverse some of the reasons why investors value shares the way they do. The same applies to the traded bond prices that the AER uses to estimate the cost of debt. All of these prices reflect the value to investors – *all* of the considerations that are relevant to how investors value the stock are reflected in the price.

[25] Jemena Draft Decision Attachment 4, p. 43.

### Summary of AER's position

53. The AER's position is that theta (and consequently gamma) no longer represents the value (as in "worth" or "market value to investors"), but now represents the proportion of credits that are likely to be redeemed. The AER is not saying that it has identified a number of approaches for estimating the value (as in "worth to investors in the market") of imputation credits. Rather, the AER considers:

    a) Some approaches for estimating the value (as in "worth to investors in the market") of imputation credits – the market value studies; and

    b) Some approaches for estimating the redemption rate – the equity ownership and ATO tax statistic approaches.

### The basis for the AER's conceptual redefinition of theta

54. In my view, the AER has erred when it considers the redemption rate to be commensurate with the concept of a weighted-average representative investor. Under the assumptions of these models, the weighted-average representative investor determines the extent to which the value of imputation credits is reflected in share prices. In these models, theta (or the "utilisation rate" as Lally and Van Zijl refer to it) reflects the extent to which imputation credits are reflected in share prices.

55. These models do *not* imply that there is an equivalence between the "utilisation rate" and the proportion of credits that investors redeem. Yet the AER's approach is based on the assumption that there *is* an equivalence between these two things. In fact, the AER goes further and simply *defines* the utilisation rate *to be* the proportion of credits that investors redeem – based on the AER's understanding of representative agent equilibrium models. In advice commissioned by the AER, Lally (2013 AER) has advised that the AER has erred in its approach:

> The AER (2013, page 237) also defines the utilisation rate as the proportion of distributed credits that investors redeem. This is not correct; the redemption rate is merely an estimation method.[26]

56. My previous report highlighted this important issue,[27] but the AER has not yet responded to it.

57. In my view, there is no reasonable basis for the AER's approach of simply defining theta to be the redemption rate. I consider this issue in more depth in Section 4 of this report.

### Value and redemption rate are materially different

58. It is important to understand that the AER's new approach does not suggest that theta still represents the value (as in "worth to investors") of imputation credits and that the redemption rate is simply a relevant method for estimating the value to investors. The Australian Competition Tribunal (**Tribunal**) has already ruled that the redemption rate cannot be used to estimate the value (as in "worth to investors") of imputation credits, but can only be used as an upper bound – such that no reasonable point estimate could exceed this upper bound.[28]

[26] Lally (2013a), p. 13.
[27] SFG (2014 Gamma), p. 76.
[28] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 91.

59. Rather, the AER now considers that theta never represented the value (as in "worth to investors") of imputation credits in the first place; that theta should always have been defined as the redemption rate. That is, the AER's new approach represents a "conceptual re-evaluation," not just an expansion of the estimation methods that might be applied to estimate the same concept.

60. In its Rate of Return Guideline, the AER concluded that the value of imputation credits (as in the "worth" of credits in the market):

> is not consistent with our interpretation of the conceptual framework,[29]

and:

> does not align with the conceptual definition of utilisation rate.[30]

61. That is, the AER has concluded that the market value of imputation credits is an entirely different concept to its redemption rate interpretation of theta. I agree that these two concepts are entirely different. In my previous report to the AER I provided a number of reasons why one would expect there to be a difference between the proportion of credits that are redeemed by investors and the value of those credits to investors.[31]

### Alignment of estimation approaches

62. Because the value and redemption rate interpretations of theta are very different things, one needs to determine which concept should be adopted and then select estimation methods that estimate the right thing.

63. For example, in its Guideline the AER concluded that:

> There are a number of conceptual reasons why the market value of imputation credits does not align with the relevant utilisation rate.[32]

64. I agree that empirical methods that seek to estimate the value of distributed credits cannot be used to estimate the redemption rate. Of course, the reverse is also true – methods that estimate the redemption rate do not provide an estimate of the value (as in "worth") of distributed credits.

65. In its recent draft decisions, the AER continues to adopt the same interpretation of theta that it adopted in the Guideline:

> This is the interpretation of the value of imputation credits we adopted in the Guideline and continue to adopt in this decision.[33]

66. Thus there are two different conceptual interpretations of theta:

    a) The value (as in "worth" to investors) of distributed credits; or

[29] AER Rate of Return Guideline, Explanatory Statement, p. 159.
[30] AER Rate of Return Guideline, Explanatory Statement, p. 168.
[31] SFG (2014 Gamma), pp. 13-15.
[32] AER Rate of Return Guideline, Explanatory Statement, p. 176.
[33] Jemena Draft Decision, Attachment 4, p. 35.

b) The proportion of distributed credits that is likely to be redeemed by investors.

67. These two conceptual interpretations are inconsistent with each other and each would be estimated by different methods.

### Estimation methods

68. Having determined which of the conceptual definitions of theta is to be adopted, the corresponding estimation techniques must then be employed:

a) If theta is to be interpreted as the value of distributed credits, then it must be estimated using empirical techniques that are designed to estimate the value of distributed credits; and

b) If theta is to be interpreted as the proportion of credits that are redeemed, then it must be estimated using empirical techniques that are designed to estimate the proportion of credits that are redeemed.

69. The AER proposes two techniques for estimating the proportion of credits that are redeemed:

a) The equity ownership approach – an estimate of the proportion of Australian shares that are owned by resident investors; and

b) ATO tax statistics – an estimate of the ratio of redeemed credits to distributed credits.

70. Neither of these approaches provides an estimate of the value (as in worth to investors) of imputation credits. The value of distributed credits can be estimated using a market value approach such as:

a) Dividend drop-off analysis, which estimates the market value of dividends and imputation credits as the difference between (a) the market value of a share including the dividend and credit, and (b) the market value of a share excluding the dividend and credit; and

b) Simultaneous pricing analysis, which estimates the market value of dividends and imputation credits as the difference between (a) the market value of a share, which entitles the owner to receive the dividend and credit, and (b) the market value of a futures contract, which does not entitle the owner to receive the dividend and credit.

71. If theta is to be defined as the value (as in worth to investors) of imputation credits, the redemption rate estimates cannot be used to estimate theta. They can, at best, be used to provide an upper bound for theta. The AER and Tribunal have both previously accepted this point:

> The AER accepted that utilisation rates derived from tax statistics provide an upper bound on possible values of theta. Setting aside the manner in which the AER derived a value from the tax statistics study, it correctly considered that information from a tax statistics study was relevant. However, its relevance could only be related to the fact that it was an upper bound. No estimate that exceeded a genuine upper bound could be correct. Thus the appropriate way to use the tax statistics figure was as a check.[34]

72. By contrast, if theta is to be redefined as the redemption rate, then studies that estimate the redemption rate would (tautologically) provide an appropriate estimate of theta.

[34] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 91.

## 3. Rationale for the "value" interpretation of theta

### Consistency with the building block approach

73. The only way to ensure that investors are not under- or over-compensated is for the regulator to make an adjustment in relation to imputation credits that reflects the value (as in "worth") of those credits to investors.

74. Under the building block approach, having settled on its estimate of theta (and consequently gamma), the regulator will then make an adjustment to the allowed return to investors, as set out in Paragraph 27 above. Suppose, as in that example, the regulator determines that investors require a total return of $100. Suppose that imputation credits with a face value of $15 are redeemed, but the value to investors from redeeming those credits is $10.[35] In this case, a regulator who is adopting the redemption rate interpretation of theta would reduce the allowed return to investors by $15. Thus, investors would receive an allowed regulatory return of $85 from the firm and imputation credits that were worth $10 to them – a total of $95. This is less than the $100 total return that the regulator has estimated to represent the efficient financing cost – it leaves investors under-compensated relative to the regulator's own calculations.

75. One point that appears to be generally accepted is that the value (as in "worth") to investors of distributed credits is lower than the proportion of them that are redeemed. That is, the value of credits to investors is lower than the redemption rate. For example, the SFG dividend drop-off estimate of the value of credits is 0.35 and the AER's Guideline indicated a range of 0.0 to 0.5 for market value studies,[36] whereas the AER's estimates of the redemption rate are materially higher.[37] This is also consistent with the Tribunal's statements that redemption rates do not estimate the value of credits, but provide an upper bound.

76. Under the building block approach, the regulator makes an estimate of gamma and then reduces the return that is available to investors from dividends and capital gains from the firm accordingly. In my view, it is clear that this is consistent with a *value* interpretation. If the *value* of foregone dividends and capital gains is greater than the *value* of received imputation credits, the investors will be left under-compensated, and vice versa.

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[35] A number of reasons why there may be a difference between the value of distributed credits and the redemption rate are set out in SFG (2014 Gamma). However, the key issue for the point being made here is simply that there *is* a difference – a point that would seem to be uncontentious.

[36] AER Rate of Return Guideline, p. 24. In the Jemena Draft Decision, Attachment 4, Table 4-2, pp. 4-14 to 4-15, the AER reports an estimate of the value of a distributed credit within the range of 0 to 1 from implied market value studies, and a figure of 0.35 with respect to the SFG study. The AER also reports a figure of 0.40 with respect to the SFG study, under the interpretation that 0.35 represents the value of credits as a proportion of the value of cash dividends, which was estimated at 0.88. So, 0.35 ÷ 0.88 = 0.40. The AER's reported range of 0 to 1 for value implied by market value studies simply represents bounds formed without giving any consideration at all to the merits of one method, time period, dataset, consideration of outliers, researchers' interpretation, or any other evidence. It does not represent an estimate that gives any holistic interpretation of the evidence. The AER's adjusted figure of 0.40 with respect to the SFG study is based upon the incorrect view that both the estimated value of cash dividends and imputation credits need to be grossed-up to the correct figures for interpretation. This view is based upon the idea that the understatement of the value of cash dividends is due to an econometric bias that needs to be accounted for (that is, the true value of cash is 1.00 and the estimate is 0.88, and so the coefficients need to be multiplied by 1.00 ÷ 0.88 = 1.14). That adjustment is based entirely upon conjecture that the coefficients provide an under-estimate of the true value.

[37] In the Jemena Draft Decision, Attachment 4, Table 4-2, pp. 4-14 to 4-15, the AER reports estimates of the redemption rate within the range of 0.55 to 0.70 based upon listed and unlisted equity, a range of 0.40 to 0.60 based upon listed equity, and a figure of 0.43 based upon statistics reported by the Australian Taxation Office.

### Consistency with the way other WACC parameters are estimated

77. In its recent draft decisions, the AER notes that service providers submitted that all other WACC parameters are estimated with reference to actual financial market prices and that gamma should be no different.[38] The AER proposes that the estimation of gamma can be distinguished from the estimation of other WACC parameters on two bases:

    a) The estimation of gamma requires the application of regression analysis (for dividend drop-off analysis, or some other empirical technique for other market value studies), which is "unlike a valuation technique that simply involves observing the price of an asset in a market in which that asset is separately traded";[39] and

    b) For imputation credits, there is no "widely-agreed proxy" that "can be directly observable,"[40] such as is available for the risk-free rate, for example.

78. These two reasons are effectively the same. The AER's point is that gamma is not like the risk-free rate, which can effectively be observed as the contemporaneous government bond yield. Rather, gamma requires some sort of empirical estimation method, such as regression analysis, to be applied to the observable market data. But this is precisely what the AER itself does to estimate beta – it applies regression analysis to observed market prices.

79. In my view, gamma is no different from any other WACC parameter in this respect – the estimate should be obtained by applying the relevant empirical methods to the relevant market data. Specifically, for other WACC parameters, a market value interpretation is applied and traded market prices are used to estimate value (as in "worth to investors"). For example, when estimating beta, the AER uses traded stock prices, which reflect the value of those shares to investors, when estimating the cost of debt the AER uses traded bond prices which reflect the value of those bonds to investors, and so on. More specifically, the share prices that the AER uses to estimate other WACC parameters reflect the extent to which investors *value* dividends, capital gains and imputation credits. They do not reflect the extent to which investors *value* dividends and capital gains plus the extent to which they might be able to *redeem* imputation credits.

[38] Jemena Draft Decision, Attachment 4, p. 66.
[39] Jemena Draft Decision, Attachment 4, p. 66.
[40] Jemena Draft Decision, Attachment 4, p. 66.

## 4. Rationale for the "redemption rate" interpretation of theta

### The representative agent framework

#### Overview

80. Theta has always been estimated as the market value of distributed imputation credits using techniques that infer how much investors value credits from security prices. The AER now proposes to adopt an entirely different definition of theta. This new definition obviously requires some basis, and the AER proposes that their proposed redemption rate definition of theta is based on representative agent equilibrium asset pricing models. For example, the AER states that:

> The utilisation rate is the before-personal-tax reduction in company tax per one dollar of imputation credits that the representative investor receives.[41]

81. That is, the AER claims that, under the theoretical conditions of a representative agent asset pricing model, theta would be equivalent to the redemption rate. However, there are three problems with the AER's approach in this regard:

a) Representative investor equilibrium asset pricing models do not imply that theta is equivalent to the redemption rate. Lally (2013 AER) has previously advised the AER of this;

b) A representative investor equilibrium does not apply in the AER's framework because there is no (sensible) market-clearing condition;

c) In any event, the AER's approach leads to an estimate of theta that is higher than the actual value to investors, in which case it leaves investors under-compensated.

82. In the remainder of this section, I consider the basis for the AER's conceptual re-definition of theta in more detail.

#### No equivalence between representative investor and redemption rate

83. The AER makes a leap from the general notion of a representative investor in equilibrium asset pricing models to defining the "utilisation rate" as being equivalent to the redemption rate. I note in paragraph 55 above that these models do *not* imply that there is an equivalence between the "utilisation rate" and the proportion of credits that investors redeem, and that Lally (2013 AER) has advised the AER that it is wrong to make such a leap:

> The AER (2013, page 237) also defines the utilisation rate as the proportion of distributed credits that investors redeem. This is not correct; the redemption rate is merely an estimation method.[42]

84. In the remainder of this section, I explain why the AER is wrong to conclude that its interpretation of theta as being equivalent to the redemption rate can be justified by reference to any sort of equilibrium asset pricing model. The reason for this is that the representative investor equilibrium

[41] AER Rate of Return Guideline, Explanatory Statement, p. 165.
[42] Lally (2013 AER), p. 13.

framework, to which the AER appeals, only applies in the case of perfect segmentation[43] or perfect integration.[44] Lally (2013 AER) has advised the AER of this:

> Handley (2008, section 2.2) appears to believe that there is no inconsistency and believes that all CAPMs start by defining the "market", from which the "relevant" set of investors follows. Thus, if the market is Australian equities, then the relevant set of investors includes foreigners to the extent they invest in Australian equities. I do not agree. CAPMs do not start with a definition of the "market" but a set of assumptions about investor behaviour and institutional features, and the particular assumptions imply which market portfolio and set of investors are relevant. Some versions of the CAPM (such as Officer, 1994) assume complete segmentation of equity markets, in which case the relevant investors are Australian residents and the relevant market portfolio is all Australian risky assets (assets that can be purchased by Australian residents in a world in which there is complete segmentation of risky asset markets). Other versions of the CAPM assume complete integration (such as Solnik, 1974), in which case the relevant investors are those throughout the world and the relevant market portfolio would be all risky assets throughout the world.[45]

85. The AER has not sought further advice on this point from Dr Lally, but has relied on the advice of Dr Handley. This involves the AER considering a market in which there are domestic and foreign investors, but where any foreign investment holdings of both groups are ignored.[46] This is neither a completely integrated nor a completely segmented market, and therefore it does not support a representative investor equilibrium.

86. That is, in this setting one cannot rely on a representative investor equilibrium model to conceptualise an estimate of theta. The alternative to:

    a) Using a model to conceptualise what theta would be under the assumptions of that model; is to

    b) Use observed market data to estimate what theta is under the actual market conditions – which is precisely the approach that had always been adopted by all regulators prior to the AER's 2013 Guideline.

87. In the remainder of this section, I explain why a representative investor equilibrium does not apply to the AER's setting – thus ruling out the possibility of theoretically conceptualising a theta.

### Representative investor equilibrium does not apply

*A closed system is required*

88. In a representative investor model, such as the Capital Asset Pricing Model (**CAPM**), there are a number of investors and a number of assets. The investors allocate their funds across different assets in order to maximise their utility. That is, all investors construct a portfolio that is optimal for them. For example, in the CAPM investors select a portfolio that balances returns against risk. In the CAPM, investors have mean-variance preferences[47] and maximise their utility by adopting an overall

[43] Australian assets and Australian investors are completely segmented from foreign investors and foreign assets.
[44] Australian assets and Australian investors are completely and seamlessly integrated with foreign investors and foreign assets.
[45] Lally (2013 AER), pp. 14-15.
[46] AER Rate of Return Guideline, Explanatory Statement, p. 161.
[47] Mean-variance preferences simply means that investors attempt to maximise the expected return of their entire portfolio (expectation being another word for mean) and minimise the variance of returns of their entire portfolio (variance being the measure of risk that investors are concerned about in the model).

portfolio that is mean-variance efficient, satisfying what is known as the "Markowitz condition." In these models, the investors collectively purchase all of the assets and the market clears as demand equals supply.

89. The models then derive an equilibrium by solving a market clearing condition. This involves noting that:

    a) All of the *m* investors must invest all of their wealth across the *n* assets and nothing else; and

    b) All of the *n* assets must be owned entirely by the *m* investors and no one else.

90. Each of the *m* investors will hold a different amount of each of the *n* assets according to their wealth, their risk aversion and their tax status. Other things equal, wealthy investors will hold more of each asset than poor investors, highly risk averse investors will tend to hold safer portfolios, and investors who are eligible to redeem imputation credits will hold relatively more of the stocks that distribute larger amounts of those credits.

91. Because there is a closed system in which the *m* investors collectively own all of the *n* assets and nothing else, it is possible to derive the relative amount of each asset that each investor will want to hold. This will be a function of the investor's relative wealth, risk aversion and tax status. The relative demand for each asset will determine its equilibrium price and the equilibrium return that investors will require for holding it. Again, it is very important to emphasise that none of these equilibrium calculations can be performed unless the system is closed such that the *m* investors collectively own all of the *n* assets and nothing else.

92. To illustrate the necessity of a properly closed system, consider a simple example in which there are three investors and three assets. Suppose that we know the wealth of each investor and the optimal portfolio of each investor (i.e., the mix of three assets that each investor would like to own). This enables us to derive the price of each asset because the market clearing conditions hold – we can equate the supply of assets with the demand (from investors) for those same assets. For example, if the investors have a combined wealth of $100, we know that the sum of the prices of the three assets will be $100 – the market will clear. Other things being equal, an asset with more demand from more wealthy investors will trade at a higher price. This is the basis for every representative investor equilibrium model.

93. Now suppose that:

    a) The three investors are able to invest in some other "foreign" assets; and

    b) "Foreign" investors are able to invest in the three domestic assets.

94. In this case, it is not possible to derive an equilibrium market clearing condition for the three domestic assets. In the previous case, we knew that the three assets must have a combined value of $100. This is because the three investors had to own the three assets – there were no other assets and no other investors. In the current case, however, the final price of the three domestic assets must also reflect the wealth of the foreign investors and the characteristics of the foreign assets including the relationship between the domestic and foreign assets. In particular, the demand for the domestic assets will be higher if there is more foreign wealth, lower if there are more foreign assets, and lower if the returns from the foreign assets are highly correlated with the returns from the domestic assets. There is no separate representative investor equilibrium just for the three domestic assets.

95. SFG (2014 Gamma) contains a detailed discussion of this very important issue.[48]

*Previous advice to the AER on the application of equilibrium models*

96. My previous report to the AER noted[49] that Lally (2013 AER) has advised the AER that the weighted-average utilisation rate that comes out of equilibrium models such as Lally and van Zijl (2003) only applies in a closed system where the *m* investors collectively own all of the *n* assets and nothing else. That is, the model is only relevant if certain pre-conditions hold. If those pre-conditions do not hold, the model will not apply, and any attempt to apply the model will be likely to mislead.

97. However, the equity ownership approach used in the Guideline involves the attempted implementation of an equilibrium model where the pre-conditions for such a model clearly do not apply. The Guideline approach uses a result that applies only in closed systems in a system that is clearly not closed.[50] This approach remains in the Guideline even after Lally (2013 AER) has advised that it is incorrect. In fact, as set out below, Lally is critical of the AER's claims that a result that applies only in a closed system can still be used in a setting where there is no closed system.

98. My previous report also highlighted the fact that Dr Lally's advice to the AER was critical of advice provided by Handley (2008) to the effect that representative agent models somehow do not require the standard market clearing condition that I describe above. Specifically, Lally (2013 AER) states that:

> By contrast, Handley (2008, section 2.2) appears to believe that there is no inconsistency and believes that all CAPMs start by defining the "market", from which the "relevant" set of investors follows. Thus, if the market is Australian equities, then the relevant set of investors includes foreigners to the extent they invest in Australian equities. I do not agree.[51]

99. I also noted that Professor Thomas Copeland, a very senior US academic, author of a highly regarded graduate level finance textbook, and former partner at McKinsey Inc. makes the same point:

> Equilibrium under the CAPM requires that all investors in the market collectively own all of the assets in the market. This is a direct consequence of two-fund separation and the fact that aggregate borrowing equals aggregate lending, as I have indicated above. Having an investor from outside the market owning some of the assets inside the market would mean that a CAPM equilibrium could not be obtained.[52]

*Handley (2014)*

100. In its recent draft decisions, the AER has not responded to the Lally or Copeland submissions. The AER has not sought further advice on this issue from Dr Lally, but has instead commissioned Dr Handley, who has advised the AER that a representative investor equilibrium *can* be derived without the standard market clearing condition described above. The AER has accepted Dr Handley's advice on this point.

[48] SFG (2014 Gamma), Appendix 6.
[49] SFG (2014 Gamma), p. 74.
[50] By definition, a system is not closed if investors inside the system are able to invest in assets outside the system or if investors outside the system are able to buy assets inside the system.
[51] Lally (2013 AER), pp. 14-15.
[52] Copeland (2014), p. 5.

101. Specifically, Handley (2014) claims that the CAPM can be derived without a standard market clearing condition.[53] This is unambiguously false. In the CAPM, there is a single market in which the set of investors collectively own the set of assets. The CAPM equilibrium is derived by noting that all investors must collectively own all of the assets. The standard market clearing condition applies.

102. For example, Rosenberg (1981) states that:

> The CAPM rests upon the market-clearing condition that aggregate demand must equal aggregate supply. Aggregate demand is the sum of all investors' portfolios. Aggregate supply is the ensemble of securities, which, when viewed as the portfolio of all outstanding assets, is the market portfolio. [54]

and that:

> The CAPM considers supply and demand in the capital market. It exploits the market-clearing condition that, at equilibrium, demand equals supply…there are no risky assets or liabilities excluded from the problem. [55]

103. What Handley (2014) seems to be arguing is that a representative agent model can be derived by assuming that there is more than one "market" and that investors price assets in each market independent of the assets that they hold in other markets:

> …it is assumed that investors in the domestic market price domestic assets in isolation of any other assets they may or may not hold.[56]

104. This suggestion is illogical and inconsistent with the very foundations of asset pricing models such as the CAPM. The whole point of the CAPM (and indeed of all standard asset pricing models) is that investors select an investment portfolio to maximise their utility. The very first formula in Sharpe (1964) sets out the utility function that investors will seek to maximise.[57] For an investor to maximise the utility of their portfolio, they have to know how the assets relate to one another. For example, Sharpe (1964, p. 430) explains how the investor's utility depends upon the risk of the investor's portfolio, which in turn depends upon the correlation between the assets in the portfolio. In the Handley scenario, investors do not maximise the expected utility and they do not hold mean-variance efficient portfolios. Thus, the Handley scenario violates the very basis of the CAPM.

105. Moreover, just as a matter of common sense, it is illogical to consider that investors would assemble a collection of Australian stocks (and decide how much to pay for them) without any regard to the rest of their portfolio. An analogy may assist in explaining this issue. One of the jobs of a football manager is to compile the best possible team. Suppose the manager has arranged 20 scouting trips and plans to assess a number of candidates at each trip. On the first trip, the manager might identify two quality goalkeepers, decide that they both represent good value for money, and sign them both. On the second trip, the manager might identify another two quality goalkeepers. Under the Handley approach, the manager would sign them both, without any regard to the other "assets" already in his portfolio. If the manager separately optimises the value for money spent on each trip, without any regard to what has been acquired on any other trip, the outcome is likely to be a very unbalanced

[53] Jemena Draft Decision, Attachment 4, p. 42.
[54] Rosenberg (1981), p. 19.
[55] Rosenberg (1981), p. 15.
[56] Jemena Draft Decision, Attachment 4, p. 42.
[57] Sharpe (1964), p. 428.

squad. Similarly, investors will clearly consider their portfolio as a whole (including the inter-relationship between assets) when making investment decisions. Not only is this the basis of every asset pricing model, but it accords with common sense.

106. In my view, the Handley (2014) claims in relation to CAPM-type models not requiring a standard market clearing condition are untenable. I consider that the AER has been led into error by relying on this advice.

107. The alternative to developing a complex theoretical framework to justify a conceptual re-definition of what theta would be under different theoretical assumptions, is to simply estimate theta as it is – using market prices in the same way as has always been done in the past.

## 5. Issues relating to the conceptual interpretation of theta

### The bottom line

108. In the regulatory framework, the regulator first determines the return that investors would reasonably require from the benchmark firm in the absence of imputation credits. The regulator then reduces the allowed return in relation to the regulator's estimate of gamma. If the *value* of foregone dividends and capital gains is more than the *value* of received imputation credits, the investors will be left under-compensated, and vice versa.

109. In my view, the analysis need go no further than this. If the regulator reduces the allowed return in relation to imputation credits by more than the value (as in "worth") of those credits to investors, investors will be left under-compensated.

110. However, in its recent draft decisions, the AER provides an appendix to its attachment in relation to gamma that considers a number of points of contention in relation to the conceptual definition of theta. I respond to each of these in the remainder of this section.

### The AEMC rule change

111. In my view, the AEMC Rule change (which now specifically defines gamma to be "the value of imputation credits") does not support the AER's new conceptual definition. It seems clear that the intention of the AEMC was simply to tidy up the Rule to properly reflect the longstanding regulatory practice of adopting a market value interpretation of theta and gamma. The reasons for this conclusion are set out in SFG (2014 Gamma, pp. 63-64). Moreover, the NEO and NGO are centred around the need to "promote efficient investment."[58] In general, an allowed return on equity that is materially above (below) the efficient financing costs of the benchmark efficient entity will create incentives for over (under) investment, neither of which are in the long-term interests of consumers. In relation to gamma, if the regulator reduces the allowed return in relation to imputation credits by more than the value (as in "worth") of those credits to investors, investors will be left under-compensated relative to the efficient financing costs.

112. In its recent draft decisions, the AER provides a technical legal response on this issue.[59]

113. In my view, this issue has reached the point where there is nothing to add – each party has set out their views and stated their conclusions for others to now consider.

### McKenzie and Partington (2013)

114. In my previous report to the AER, I set out reasons for concluding that McKenzie and Partington (2013) do not support the AER's conceptual interpretation.[60] Although they state that the AER "makes a reasonable case," they note that the redemption rate interpretation of theta is contrary to the accepted practice of adopting a value interpretation of theta, and they go on to follow the accepted practice. In particular, they consider 15 market value studies, four of which involve Dr Partington himself.

115. McKenzie and Partington (2013) conclude by comparing:

[58] National Gas Law, s. 23.
[59] Jemena Draft Decision, Attachment 4, p. 37.
[60] SFG (2014 Gamma), pp. 64-65.

a) Their own market value estimate of gamma (which they describe as "an average across our studies"[61]); with

b) The AER's "utilisation" estimate (which they describe as "Alternatively using the AER (2013) estimate" [62]).[63]

116. In summary, the advice from McKenzie and Partington does not recommend that when estimating theta redemption rates should be used to the exclusion of market value estimates, or even in preference to market value estimates.

**Handley (2008)**

117. In my previous report to the AER, I noted that Handley (2008) advised the AER that an estimate of gamma based on the AER's redemption rate interpretation cannot be used to estimate gamma, but rather:

> may be interpreted as a reasonable upper bound on the value of gamma.[64]

118. I have included that quote in many regulatory submissions over the last six years and there has never been any suggestion of any mis-interpretation. Now, in its recent draft decisions, the AER states that:

> in his recent advice to us Handley clarified his earlier remarks and confirmed that tax statistics can produce a point estimate. [65]

119. Dr Handley's clarification is as follows:

> I have previously suggested that estimates of utilisation rates from taxation statistics can be interpreted as a reasonable upper bound estimate of the value of theta. The purpose for including the "upper bound" part was simply to convey the fact that the ultimate source of value of a distributed franking credit is the amount of personal tax saved as a result of redeeming the credit – something which is given by taxation statistics data. In other words, value can only be realized by "redeeming" the credit at the ATO. Unfortunately the "upper bound" part has inadvertently been misinterpreted as suggesting that taxation statistic estimates of theta cannot be used as point estimates of theta. [66]

120. Of course, it is clear that a credit can only have value if it is redeemed. However, I do not understand why it follows that that fact would lead someone to describe as an "upper bound" what they actually considered to be a point estimate.

121. Moreover, Dr Handley is also on the record as saying that he does *not* consider the redemption rate to be a point estimate of gamma:

[61] McKenzie and Partington (2013), p. 34.
[62] McKenzie and Partington (2013), p. 34.
[63] Since both estimates turn out to be above 0.5 their conclusion is that the QCA should not reduce its current estimate of 0.5.
[64] Handley (2008), p.8.
[65] Jemena Draft Decision, Attachment 4, p. 38.
[66] Jemena Draft Decision, Attachment 4, p. 38.

> …that's not our estimate of gamma[67]

and:

> we haven't said that's our estimate of gamma[68]

and:

> that is perhaps an upper bound for what gamma is.[69]

### Officer (1994)

#### Text

122. In my previous report to the AER, I noted that the text of Officer (1994) does not clearly state whether gamma should have a value ("as in "worth to investors") interpretation or a utilisation/redemption interpretation.[70] I noted that there were two possible interpretations:

    a) Officer means gamma to have a *value* interpretation and that words suggesting a *utilisation* interpretation were poorly drafted (i.e., the reference to utilisation should be read as simply identifying the source of value); or

    b) Officer means gamma to have a *utilisation* interpretation and that words suggesting a *value* interpretation were poorly drafted (i.e., the reference to value should be read as "the number used for" rather than "worth").

123. I concluded that the value interpretation was plausible and the utilisation/redemption interpretation was not, and set out my reasons for doing so.[71] Nothing in the AER's recent draft decisions leads me to change my conclusion on this point.

#### Formulas

124. The mathematical formulas set out in Officer (1994) also support a value interpretation. In its recent draft decisions, the AER considers the key formula from Officer (1994), as set out in Figure 1 below.

[67] AER Roundtable transcript, 10 October 2008, p. 18.
[68] AER Roundtable transcript, 10 October 2008, p. 18.
[69] AER Roundtable transcript, 10 October 2008, p. 18.
[70] SFG (2014 Gamma), pp. 66-67.
[71] SFG (2014 Gamma), pp. 66-67.

**Figure 1**
**AER's documentation of the key result from Officer (1994)**

$$E = \frac{X_O - X_D - TAX + \gamma IC}{r_e}$$

where:

- $E$ is the value of equity
- $X_O$ is operating income
- $X_D$ is the debtholders' share of operating income
- $TAX$ is corporate tax paid
- $IC$ is imputation credits generated, and
- $r_e$ is the return on equity.

Source: Jemena Draft Decision, Attachment 4, p. 40.

125. To be clear, in this formula $E$ represents the *market value* of equity, as in the worth to investors. The formula shows that the current market value of equity is equal to:

    a) The present value of operating income; minus

    b) The present value of payments made to debt holders; minus

    c) The present value of tax paid to the government; plus

    d) The present value of imputation credits.

126. In this formula, gamma represents the extent to which imputation credits are capitalised into the market value of equity. I note that this is precisely what is estimated by dividend drop-off analysis and other market value studies. The formula shows that one takes the present face value of imputation credits ($IC/r_e$) and then multiplies by gamma and the result makes up part of the market value of equity.

127. Another way to see this is to rearrange the formula to isolate gamma as follows:

$$E_{with-IC} = E_{ex-IC} + \gamma \frac{IC}{r_e}$$

where $E_{with-IC}$ represents the market value of equity including imputation credits, $E_{ex-IC}$ represents the market value of equity excluding imputation credits and $IC/r_e$ represents the present face value of imputation credits. It is clear in this formula that gamma does not represent the proportion of imputation credits that might be redeemed, but the extent to which imputation credits increase the market value of equity.

128. Suppose, for example, that the market value of equity excluding imputation credits was $1,000, that gamma is 0.25, that the required return on equity is 10% and that shareholders receive $10 of imputation credits every year. In this case, the market value of equity including imputation credits would be:

$$E_{with-IC} = E_{ex-IC} + \gamma \frac{IC}{r_e} = 1{,}000 + 0.25\frac{10}{0.1} = 1{,}025.$$

That is, 0.25 of the face value of each credit is capitalised into the market value of equity.

129. This formula can also be rearranged to isolate gamma as follows:

$$\gamma = \frac{E_{with-IC} - E_{ex-IC}}{IC / r_e}.$$

That is, in Officer (1994), gamma is the ratio of:

a) The present market value of imputation credits; to

b) The present face value of imputation credits.

Again, gamma represents the extent to which the face value of imputation credits is capitalised into the market value of equity.[72]

130. For the numerical example above, the present face value of the credits is $100 and the present market value is $25, implying a gamma of 0.25 – the extent to which credits are capitalised into the market value of equity:

$$\gamma = \frac{E_{with-IC} - E_{ex-IC}}{IC / r_e} = \frac{1{,}025 - 1{,}000}{10 / 0.1} = \frac{25}{100} = 0.25.$$

131. In its recent draft decisions,[73] the AER correctly notes that the numerator and denominator in the above equation can be multiplied by $r_e$ to give:

$$\gamma = \frac{r_e \times E_{with-IC} - r_e \times E_{ex-IC}}{IC}.$$

132. The AER also correctly notes that this expression depicts gamma in terms of the annual cash flow, rather than in terms of present values.

$$\gamma = \frac{r_e \times E_{with-IC} - r_e \times E_{ex-IC}}{IC} = \frac{0.1 \times 1{,}025 - 0.1 \times 1{,}000}{10} = \frac{2.5}{10} = 0.25.$$

133. That is, each year equity holders receive $10 of imputation credits that are worth $2.50 to them. These credits are worth (as in reflected in the market value of equity) $2.50 each year and have a present value of $25 over the life of the investment.

134. The AER is quite correct to note that the above formula has a cash flow interpretation.[74] However, the question is not about whether gamma should be written in terms of the annual cash flow or in

[72] In its recent draft decisions, the AER correctly notes that corresponding expression in SFG (2014 Gamma, Paragraph 326) inadvertently omitted the $r_e$ term from the above equation. That omission from the display of the formula had no bearing on any of the analysis or conclusions, which are repeated above.
[73] Jemena Draft Decision, Attachment 4, p. 41.
[74] Jemena Draft Decision, Attachment 4, p. 41.

terms of the present value over the life of an investment. Gamma can *always* be written in terms of both – however it is defined. Rather, the question is whether gamma has a market value interpretation or a redemption proportion interpretation. What I have shown above is that gamma has a market value interpretation, whether it is considered in terms of present values or annual cash flows:

a) Gamma represents the extent to which the present face value of all imputation credits is reflected in the market value of equity; and

b) Gamma represents the extent to which each imputation credit is valued by investors.

135. In the example above, each $10 imputation credit has a market value of $2.50 to investors. That is, investors would be indifferent between receiving the $10 credit or $2.50 of cash. In its recent draft decisions, the AER refers to this $2.50 as the "Cash flow to investors from imputation credits."[75] The AER then confuses this with the proportion of the $10 of credits that are redeemed by investors, which is a fundamentally different concept. This error leads the AER to wrongly conclude that "this expression accords with our interpretation of gamma as the *proportion* of company tax returned to investors through the utilisation of imputation credits." [76] It does not. It accords with an interpretation of gamma as the *value* (as in "worth to investors") of company tax returned to investors through the utilisation of imputation credits – as shown above.

### Hathaway and Officer (2004)

136. In its recent draft decisions, the AER states that Hathaway and Officer (2004) can be interpreted as having a cash flow interpretation. As set out in the preceding paragraphs, the relevant question is not about whether gamma should be written in terms of the annual cash flow or in terms of the present value over the life of an investment. Gamma can *always* be written in terms of both – however it is defined. Rather, the question is whether gamma has a market value interpretation or a redemption proportion interpretation. Table 1 below should help to clarify this issue.

**Table 1**
**Draft decision estimates of gamma based on redemption rate re-definition of theta**

| | Annual cash flows | Life of investment |
|---|---|---|
| **Market value interpretation of gamma** | Gamma represents the market value of the imputation credits that are created each year. | Gamma represents the market value of the imputation credits that are created over the life of the investment. |
| **Redemption rate interpretation of gamma** | Gamma represents the proportion of the imputation credits that are created each year that are likely to be redeemed by investors. | Gamma represents the proportion of the imputation credits that are created over the life of the investment that are likely to be redeemed by investors. |

137. The AER misses the point when it states in its recent draft decisions that "SFG did not state whether or not it agreed that the quoted passage supports the cash flow interpretation." [77] It does not matter whether an author expresses the idea in terms of annual cash flows or in terms of the present value over the life of the investment. The only relevant question is whether they adopt a value

[75] Jemena Draft Decision, Attachment 4, p. 42.
[76] Jemena Draft Decision, Attachment 4, p. 42, emphasis added.
[77] Jemena Draft Decision, Attachment 4, p. 39.

interpretation or a redemption rate interpretation. In that regard, Hathaway and Officer (2004) state that:

> Gamma is…the *value* of all possible credits, that is, the *value* of all tax payments giving rise to the creation of credits.[78]

### Interpretation of comments from the Tribunal

138. In its 2009 WACC Review, the AER further proposed that redemption rates could be used to estimate that "per dollar value of a distributed credit." However, the Tribunal ruled that redemption rates cannot be used to estimate theta (at least insofar as theta is interpreted as the per dollar value of a distributed credit). Specifically, the Tribunal held that redemption rates do not produce an estimate of value. In particular, the Tribunal held that redemption rates provide no more than an upper bound check on estimates of theta obtained from the analysis of market prices, and that it is wrong to interpret such an estimate as a point estimate rather than as an upper bound:

> The AER accepted that utilisation rates derived from tax statistics provide an upper bound on possible values of theta. Setting aside the manner in which the AER derived a value from the tax statistics study, it correctly considered that information from a tax statistics study was relevant. However, its relevance could only be related to the fact that it was an upper bound. No estimate that exceeded a genuine upper bound could be correct. Thus the appropriate way to use the tax statistics figure was as a check.[79]

139. In my view, it is reasonable to conclude from this that the Tribunal has ruled that redemption rates cannot be used to estimate the value of a distributed credit. However, in its recent draft decisions, the AER states that:

> …we disagree with SFG's characterisation of the Tribunal's decision. It does not appear to us that the Tribunal sought to draw any conclusions about redemption rate (tax statistics) studies or any other estimation approach beyond the material advanced to it during the review.[80]

140. My interpretation of all of this is as follows. I agree that the Tribunal has not made a ruling on whether theta should be defined as the value of distributed credits or as the proportion of them that are likely to be redeemed. This is because in the regulatory setting the "value" interpretation was uniformly adopted and agreed upon up until the AER's draft Guideline. The Tribunal has always worked within the "value" interpretation because no party has ever submitted to it that a different interpretation should be considered.

141. Thus, the Tribunal's statement that redemption rates cannot be used to estimate theta is conditional on theta being interpreted as the *value* of distributed credits. This is why I submitted that "that the Tribunal has ruled that redemption rates cannot be used to estimate the value of a distributed credit."[81]

142. In summary:

[78] Hathaway and Officer (2004), p. 7.
[79] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 91.
[80] Jemena Draft Decision, Attachment 4, p. 32.
[81] SFG (2014 Gamma), Paragraph 16(b).

a) If theta is interpreted as the value (as in "worth to investors") of distributed credits, as was uniformly agreed prior to the draft Guideline, the Tribunal has ruled that redemption rates do not provide an appropriate estimate of theta; and

b) If theta is defined to be the redemption rate, then of course it will be the case that redemption rates (tautologically) provide an appropriate estimate.

## 6. Updated empirical estimates

### Equity ownership approach

143. In its Guideline, the AER adopted an estimate of the proportion of domestic equity ownership that was based on 2007 data reported by the Australian Bureau of Statistics (**ABS**). In my previous report to the AER, I noted that:

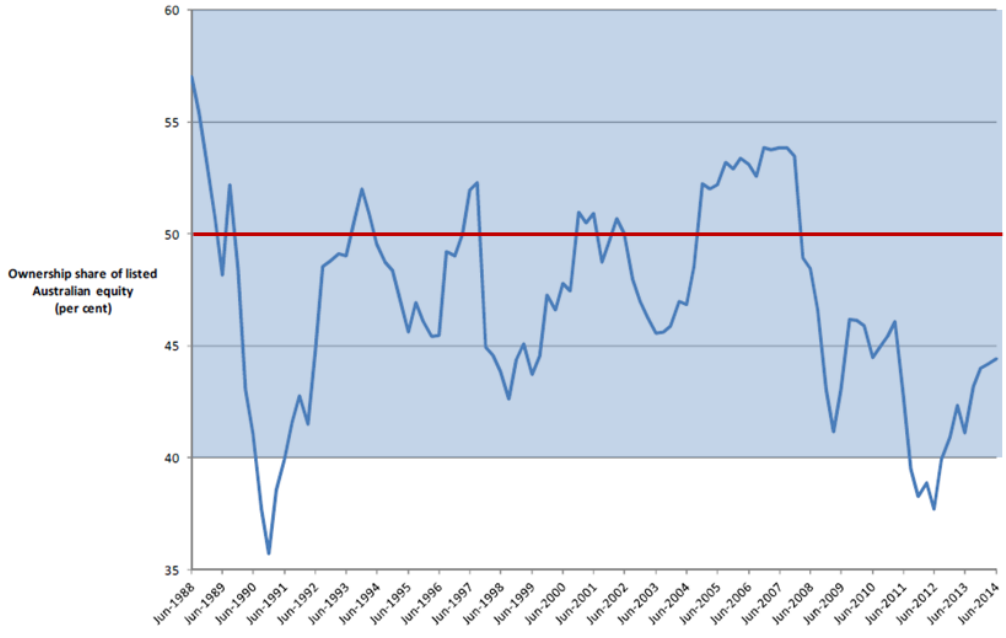
> A more recent RBA paper shows that the 2007 ABS estimate of the proportion of foreign equity ownership is materially lower than previous and subsequent estimates. That is, the 2007 estimate happens to produce the lowest estimate of foreign equity ownership (and consequently the highest estimate of theta) of any point in the last 10 years.[82]

144. Moreover, the ABS headline data includes equity in state-owned entities which are not relevant and which have the effect of inflating the estimate of domestic ownership.

145. In its recent draft decisions, the AER acknowledges the problems with its prior estimates and indicates that it has now "examined more closely the relevant data"[83] which has "allowed us to update and refine our estimates."[84] This process has led to a departure from the AER's Guideline estimate.[85]

146. In relation to listed equity, the AER provides the updated and refined data that is summarised in Figure 2 below.

**Figure 2**
**AER refined and updated domestic share of listed Australian equity**




Source: Jemena Draft Decision, Attachment 4, p. 56.
The shaded area is the AER's proposed range. The red line represents the mid-point of the AER's proposed range.

[82] SFG (2014 Gamma), p. 82.
[83] Jemena Draft Decision, Attachment 4, pp. 54.
[84] Jemena Draft Decision, Attachment 4, pp. 54.
[85] Jemena Draft Decision, Attachment 4, pp. 57.

147. The AER interprets this evidence as supporting an estimate in the range of 0.4 to 0.6. In my view, there are two problems with this conclusion:

    a) To the extent that domestic equity ownership is relevant, what is required is an estimate that is commensurate with the prevailing conditions in the market – as is the case for all parameters relating to the return on equity.[86] The regulatory process reduces the return that would otherwise flow to shareholders over the forthcoming regulatory period by the assumed value of imputation credits over the forthcoming regulatory period. It is not clear why estimates of what the domestic equity ownership proportion was in the 1980s are relevant to the current determination for the forthcoming regulatory period. This data represents an estimate of the domestic equity ownership proportion at each point in time. I see no reason why estimates that are more than 25 years out of date would receive the same weight as current estimates. In this regard, I note that the most recent estimate is 44% and that it has been more than six years since the estimate was materially above 44%; and

    b) Even if the entire history of the domestic equity ownership proportion is considered to be equally relevant, the proposed range of 0.4 to 0.6 is not a reasonable characterisation of that data:

        i) None of the estimates are above 0.6, but several are below 0.4;

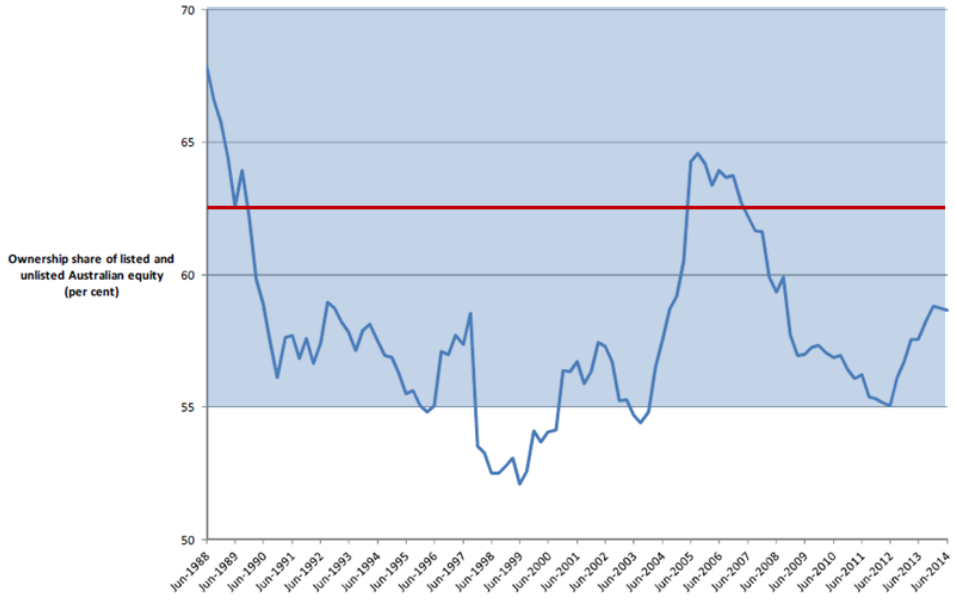
        ii) It is only the first estimate in the series that is above 0.55 (the top quarter of the range), whereas a large proportion of the estimates are below 0.45 (the bottom quarter of the range); and

        iii) The vast majority of the estimates are below the 0.5 mid-point of the proposed range.

148. For the reasons set out above, it is my view that the most recent estimate of 0.44 is a more reasonable characterisation of the evidence that is set out in Figure 2 above. The same issues apply to the AER's updated and refined estimates of the domestic equity ownership proportion for listed and unlisted Australian equity, set out in Figure 3 below.

[86] See, for example, NER 6.5.2(g).

**Figure 3**
**AER refined and updated domestic share of listed and unlisted Australian equity**




Source: Jemena Draft Decision, Attachment 4, p. 56.
The shaded area is the AER's proposed range. The red line represents the mid-point of the AER's proposed range.

149. The AER interprets these estimates as supporting a range of 0.55 to 0.7. The current estimate is 0.58, marginally above the lower bound of the proposed range.

150. Even if the entire history of estimates are considered to be equally relevant, the proposed range of 0.55 to 0.7 is not a reasonable characterisation of that data:

    a) None of the estimates are above 0.7, but several are below 0.55;

    b) It is only the first two estimates in the series that are above 0.65 (the top third of the proposed range), whereas the vast majority of the estimates are below 0.6 (the bottom third of the range); and

    c) The vast majority of the estimates are below the 0.625 mid-point of the proposed range.

151. For the reasons set out above, it is my view that the most recent estimate of 0.58 is a more reasonable characterisation of the evidence that is set out in Figure 3 above.

### ATO tax statistics

152. In its recent draft decisions, the AER notes that its Guideline concluded that ATO tax statistics supported a range of 0.4 to 0.8 based on Hathaway (2013) and Handley and Maheswaran (2008).[87] In particular, the AER considered three estimates:

    a) An estimate of 0.43 from Hathaway that was based on post-2004 data and which is consistent with a distribution rate of 0.7; [88]

[87] Jemena Draft Decision, Attachment 4, p. 59.
[88] Jemena Draft Decision, Attachment 4, p. 59.

b) An estimate of 0.61 from Hathaway that was based on post-2004 data and which is consistent with a distribution rate of 0.5; [89] and

c) An estimate of 0.81 from Handley and Maheswaran that was based predominantly on pre-2004 data.

153. Since the Guideline, the AER has "continued to examine this evidence"[90] and has now come to the view that:

a) "the ATO statistics are subject to a number of issues prior to 2004;" [91] and

b) The estimate should be "consistent with our preferred estimates of the distribution rate" [92]

which would seem to leave only Hathaway's estimate of 0.43.

154. In line with this reasoning, the AER has departed from its Guideline estimate of the redemption rate from ATO tax statistics in favour of a point estimate of 0.43.

### Market value studies

155. In its recent draft decisions, the AER notes that in its Guideline it concluded that market value studies supported an estimate between 0 and 0.5 (mid-point of 0.25). The AER explains that:

> This range was determined with regard to a range of studies, with higher regard given to those studies that:
>
> • used longer data periods
>
> • used data since 2000, when the change in tax law entitled eligible investors to a refund of credits that exceeded their tax liability
>
> • encompassed the breadth of the market instead of just selected firms, and
>
> • appeared to use more reasonable and robust econometric treatments.[93]

156. In my view all of these considerations are perfectly sensible. Indeed, I would consider most of them to be self-evident and unarguable. For example, it is hard to imagine how the quality of the estimate can generally be improved by using less data or less reasonable and less robust econometric treatments. Also, there is now a large amount of post-2000 data available – sufficient to produce robust estimates pertaining to the current tax regime.

157. However, the AER has now decided to re-introduce studies that were rejected in the Guideline because:

a) They used a small sample of data; or

b) They related to a different tax regime; or

[89] Jemena Draft Decision, Attachment 4, p. 59.
[90] Jemena Draft Decision, Attachment 4, p. 59.
[91] Jemena Draft Decision, Attachment 4, p. 59.
[92] Jemena Draft Decision, Attachment 4, p. 59.
[93] Jemena Draft Decision, Attachment 4, p. 23.

c) They examined a small sample of firms (for one study, a single firm!); or

d) The econometric treatments were not reasonable and robust.

158. The re-introduction of these studies has led the AER to revise its range of estimates of the market value of distributed credits from 0-0.5 (mid-point of 0.25) to 0-1. That is, the top half of the range that has been proposed in the recent draft decisions is due entirely to evidence that the AER had already considered and rejected (for the reasons set out above) in its Guideline.

159. The reason for the departure from the Guideline to reintroduce these previously rejected studies is said to be:

> …with regard mainly to the view of McKenzie and Partington that there is no obvious manner by which the results of implied market value studies should be filtered, we no longer propose to do so.

160. The reference above is to the McKenzie and Partington (2013 QCA) report commissioned by the Queensland Resources Council. The sum total of the analysis of this issue by McKenzie and Partington is as follows:

> The question is how to combine the information in these estimates. You might weight the studies by timeliness, or by perceived quality, or by precision, or by the extent to which they are independent of each other. With no obvious answer to these questions, we have chosen to give them equal weight.[94]

161. Based on this new "evidence" the AER has departed from its Guideline. In my view, this departure has no basis relative to the more reasonable and considered approach that was adopted in the Guideline. My view is that the Guideline estimate of 0 to 0.5, with a mid-point of 0.25 is a more reasonable characterisation of the range of relevant market value evidence.

162. The AER's recent draft decisions raise a number of issues in relation to the reliability of market value studies, most of which have already been addressed in previous submissions to the AER. I consider those issues in Section 7 below.

### Conceptual goalposts approach

163. In its recent draft decisions, the AER has departed from its Guideline by disregarding the "conceptual goalposts" approach. In my previous report to the AER I set out a number of reasons why the conceptual goalposts approach should be disregarded.[95] My views on that matter have not changed, so I agree with the AER's decision to have no further regard to that approach.

### The AER's analysis of the evidence

#### The Guideline approach

164. In its Rate of Return Guideline, the AER explains the approach it took to distilling what it considered to be the relevant evidence into a single point estimate for gamma. In relation to theta (or what the AER now refers to as the "utilisation rate"), the Guideline states that the first step in the AER's

[94] McKenzie and Partington (2014 QRC), p. 34.
[95] SFG (2014 Gamma), pp. 89-94.

approach was to consider the equity ownership and ATO tax statistics evidence – that being the evidence that is consistent with the AER's conceptual re-definition of theta in terms of the redemption rate rather than the value of distributed credits. The AER concluded that these pieces of evidence supported a point estimate of 0.7:

> On balance, we consider that an estimate for the utilisation rate of 0.7 reasonably reflects the estimates produced by the alternative approaches presently before us. This is with due regard to the strengths and weaknesses of each approach. The equity ownership approach, to which we have most regard, suggests a utilisation rate of 0.7 to 0.8. Taxation studies, to which we have regard, suggest estimates of 0.4 to 0.8. These give us some cause to consider that a reasonable estimate lies closer to 0.7 than 0.8.[96]

165. In the next step of its approach, the AER considered the market value evidence and the conceptual goalposts approach. The AER considered that the market value evidence supported a range of 0-0.5 for the value (as in "worth to investors") of distributed credits. The AER also considered that the conceptual goalposts approach supported an estimate of 0.8-1. The AER treats this as an estimate of the distribution rate, consistent with its conceptual re-definition, although I remain of the view that this is not an estimate of anything.

166. The AER then notes that one of these pieces of secondary evidence provides an estimate below its primary estimate of 0.7, and the other provides an estimate above the primary evidence. Thus, these two pieces of evidence apparently neutralise each other, leaving the primary estimate of 0.7 intact:

> We have less regard to implied market value studies and the conceptual goalposts approach. However, the former suggests the utilisation rate might be lower than 0.7, and the latter suggests it might be higher than 0.7. In view of the limitations of these final two approaches, and the offsetting directional implications, we consider our estimate is reasonable.[97]

167. However, given that the AER has defined theta to be the redemption rate, it is not clear why evidence of something quite different is relevant. The AER defines theta in a particular way, and the market value studies provide an estimate of something quite different. It is not clear how such an apples-with-oranges comparison of a point estimate of the value of distributed credits with a point estimate of the redemption rate is useful.

168. In my view, the proper approach is much simpler. If one considers theta to be the redemption rate, one should use methods to estimate the redemption rate. If one considers theta to be the value of distributed credits, one should use methods to estimate the value of distributed credits. In my view, this mixing of estimates of different things is likely to lead to inconsistency and error.

### The approach in recent draft decisions

169. Table 2 below summarises the estimates of gamma, based on the redemption rate re-definition of theta, that are set out in the AER's recent draft decisions. The AER concludes that these estimates support a gamma estimate of 0.4.

[96] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[97] AER Rate of Return Guideline, Explanatory Statement, p. 160.

**Table 2**
**Draft decision estimates of gamma based on redemption rate re-definition of theta**

| Estimation approach | Theta | F | Gamma |
|---|---|---|---|
| Equity ownership (all equity) | 0.55 - 0.70 | 0.70 | 0.39 - 0.49 |
| Tax statistics (all equity) | 0.43 | 0.70 | 0.30 |
| Equity ownership (listed equity) | 0.40 - 0.60 | 0.80 | 0.32 - 0.48 |

170. The AER then considers the market value interpretation of theta (and consequently gamma). As set out in paragraphs 155 to 162, the recent draft decisions reintroduce pre-2000 studies. The AER concludes that these studies now support a range of 0 – 1 for the "value" definition of theta. When this is paired with the AER's estimate of 0.7 – 0.8 for the distribution rate, the range for gamma is 0 – 0.8. The AER then concludes that:

> A value of 0.4 is also reasonable in light of the evidence from implied market value studies which produces results both higher and lower than this value, and the lesser degree of reliance we have placed upon these studies.[98]

171. The Guideline concludes that the primary estimate should be maintained on the basis that (a) the market value studies support a lower estimate, but (b) the conceptual goalposts approach supports a higher estimate. In the recent draft decisions the AER has abandoned the conceptual goalposts approach, leaving market value studies as the only secondary source of evidence (warranting a "lesser degree of reliance"). The Guideline states that the market value evidence supports a lower estimate of gamma (mid-point of 0.25). However, the inclusion of pre-2000 studies increases the top end of the AER's range of market value evidence so that it now spans the range of redemption rate estimates.

172. In my view, the mixing of estimates of different things is likely to lead to error. If one considers theta to be the redemption rate, one should use methods to estimate the redemption rate. If one considers theta to be the value of distributed credits, one should use methods to estimate the value of distributed credits.

[98] Jemena Draft Decision, Attachment 4, p. 15.

## 7. New issues raised in relation to market value studies

### Reliance on a single study

173. In its recent draft decisions, the AER notes that its conceptual re-evaluation of theta has led it to reject its previous interpretation of theta as being the value of distributed credits in favour of its new interpretation of theta as being the redemption proportion. This leads the AER to conclude that:

> We do not consider it reasonable to rely exclusively on the implied market value studies class of evidence.[99]

174. However, if the AER is right about theta representing the redemption rate and not the value of distributed credits, then studies that estimate the value of distributed credits would not be relevant at all – those studies would provide estimates of the wrong thing. Market value studies would only be relevant if theta (and consequently gamma) represents the value of imputation credits. I assume this to be the case for the remainder of this section – otherwise any consideration of market value studies would be irrelevant.

175. Assuming that market value studies are relevant to the task of estimating theta, I note that the AER makes the further point that:

> We do not consider it reasonable to rely exclusively on the results of a single study from within the class of implied market value studies (that is, SFG's dividend drop off study).[100]

176. I agree that the appropriate approach is for the regulator to consider all relevant evidence whenever estimating any parameter. There would seem to be two considerations here:

a) Whether dividend drop-off studies other than the SFG study should be considered; and

b) Whether market value studies that use different approaches should be considered.

177. In relation to dividend drop-off studies, I first note that the dividend drop-off literature has evolved over time, as do all areas of scientific investigation. This evolution has seen the development of different variations of the econometric specification, different variations of regression analysis, and different types of sensitivity and stability analyses. It has also seen material growth in the available data. The SFG studies use the latest available data, and they apply a range of econometric specifications, regression analysis and sensitivity and stability analyses that have been developed in the literature. The SFG estimate of 0.35 is based on this comprehensive analysis. It is not as though the SFG studies use one of the reasonable approaches and other studies use different reasonable approaches. The SFG studies are comprehensive state-of-the-art studies.

178. The Tribunal has accepted the estimates from the SFG dividend drop-off study:

> The Tribunal is satisfied that the procedures used to select and filter the data were appropriate and do not give rise to any significant bias in the results obtained from the analysis. Nor was that suggested by the AER.[101]

[99] Jemena Draft Decision, Attachment 4, p. 15.
[100] Jemena Draft Decision, Attachment 4, p. 15.
[101] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraphs 18-19.

> In respect of the model specification and estimation procedure, the Tribunal is persuaded by SFG's reasoning in reaching its conclusions. Indeed, the careful scrutiny to which SFG's report has been subjected, and SFG's comprehensive response, gives the Tribunal confidence in those conclusions.[102]

179. The Tribunal went on to conclude that:

> The Tribunal is satisfied that SFG's March 2011 report is the best dividend drop-off study currently available for the purpose of estimating gamma in terms of the Rules.[103]

180. That is, there is no question about the fact that:

a) What SFG have done is appropriate;

b) It was properly executed; and

c) It supported the proposed estimate of 0.35.

181. The alternative to relying on the SFG study would be to dilute that evidence by placing some weight on earlier dividend drop-off studies that examine smaller and older data sets and which use methodologies that do not reflect the full evolution of the relevant literature. By contrast, the SFG studies represent the culmination of that literature. In my view, the estimation task is not aided by diluting the comprehensive up-to-date evidence with outdated evidence.

182. In relation to the use of market value studies other than the SFG dividend drop-off studies, I have previously submitted to the AER an update of the Cannavan, Finn and Gray (2004) study that was published in the prestigious *Journal of Financial Economics*.[104] That study compares the prices of securities that entitle the holder to receive dividends and imputation credits (ordinary shares) with the simultaneous prices of securities on the same firm that do not entitle the holder to receive any dividends or imputation credits (futures contracts). Cannavan, Gray and Hall (2014) report an estimate of 0.13 using this approach.

183. In my previous report to the AER, I submitted that:

> In all of the alternative market value studies over the last five years, the authors have concluded that the evidence supports an estimate of theta between 0 and 0.35.[105] We note that, relative to these alternative market value studies, dividend drop-off analysis has a longer history, has been subjected to a higher level of scrutiny (especially the SFG 2011 study), and the strengths and weaknesses of the approach, and the econometric issues, are better understood. Consequently, we maintain a theta estimate of 0.35 – from dividend drop-off analysis – in this report noting that this is a conservative estimate in that the other relevant evidence produces lower estimates.[106]

184. I remain of the view that 0.35 is a conservative estimate of the market value of distributed imputation credits.

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[102] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.
[103] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 29.
[104] SFG (2014 Gamma), p. 38.
[105] See, for example, the list of studies set out in AER Rate of Return Guideline, Explanatory Statement, Appendix H, Table H.8, pp. 173-174.
[106] SFG (2014 Gamma), p. 38.

### Econometric issues

185. In its recent draft decisions, the AER lists several econometric concerns that it has in relation to dividend drop-off analysis.[107] I have addressed all of these points in detail in two previous submissions to the AER, and these submissions have not been acknowledged in the AER's Guideline materials or its recent draft decisions. The list of "limitations of implied market value studies"[108] is set out below, together with a brief response and references to the two previous occasions on which I have already responded to each point:

a) **These studies can produce nonsensical estimates of the utilisation rate; that is, greater than one or less than zero**.

If a dividend drop-off study produced an implausible estimate, that would be a reason to reject that dividend drop-off study. The fact that it is possible that a dividend drop-off study might produce an implausible estimate is not a reason for rejecting all dividend drop-off studies. The SFG dividend drop-off analyses do not produce implausible estimates. Rather, the SFG estimates have been shown to be stable and robust to the inclusion or exclusion of influential observations.

I have previously dealt with these issues at SFG (2014 Gamma), pp. 33-34 and Appendix 9.

b) **The results of these studies can reflect factors, such as differential personal taxes and risk, which are not relevant to the utilisation rate.**

This is not an econometric point; it is a conceptual one. I agree that dividend drop-off analyses seek to estimate the value (as in "worth to investors") of imputation credits and that they do not provide an estimate of the "utilisation rate" defined in terms of the redemption proportion. I also agree that if the relevant conceptual task is to estimate the redemption rate, all market value studies would be irrelevant.

c) **The results of dividend drop-off studies might not be reflective of the value of imputation credits to investors in the market as a whole**.

The AER has previously argued that the increased trading volume that occurs around ex-dividend dates could potentially affect the estimates. I have previously responded to this point in great detail, explaining why, if anything, this additional trading would have the effect of increasing the estimate of theta.

I have previously addressed this issue at pp. 31-32 of SFG (2014 Gamma) and at ENA (2013), Section 7.9, pp. 119-123.

d) **These studies can be data intensive and employ complex and sometimes problematic estimation methodologies**.

The fact that the relevant data must be collected is not a reason for rejecting all dividend drop-off studies. The relevant data is readily available and it has already been collected and analysed and the results have already been tabulated. Moreover, the dividend drop-off regression methodology is no more complex than the regression methodology that the AER or its experts use to estimate beta.

[107] Jemena Draft Decision, Attachment 4, p. 22.
[108] Jemena Draft Decision, Attachment 4, p. 22.

I have previously addressed the miscellaneous issues relating to "problematic estimation methodologies" at SFG (2014 Gamma), p. 34 and at ENA (2013), Section 7.11, pp. 127-132.

e) **The combined value of dividends and imputation credits must be allocated between the dividend and the imputation credit**.

The dividend drop-off approach does allocate the combined value of the dividends and imputation credits between each component. The benefit of this approach is that the sum of the components must equal the estimate of the whole. By contrast, the AER approach implies a combined value of dividends and imputation credits that is materially inconsistent with the empirical estimate.

I have previously addressed this issue at SFG (2014 Gamma) pp. 31-32 and at ENA (2013), Section 7.10, pp. 123-127.

### Interpretation of theta in dividend drop-off studies

186. In its recent draft decisions, the AER notes that dividend drop-off studies estimate the value to investors of distributed imputation credits. They do this by comparing the cum-dividend share price (which includes the credit) with the ex-dividend share price (which does not include the credit) to determine how much of the share price the market ascribed to the credit. This is an estimate of the market value of the credit.

187. The AER then goes on to propose that theta does not represent the value that investors ascribe to the credit, but rather the value of the credit *relative to* the value of the dividend. This relative valuation can be obtained by dividing the estimated value of the credit by the estimated value of the dividend:

> the estimate of the utilisation rate from a given study can be divided by investors' estimated valuation of dividends from the same study. Therefore, Handley and Lally advised that the 0.35 estimate from SFG's dividend drop off study should in fact be interpreted as an estimate of around 0.4.[109]

*The proposed adjustment is not required*

188. In our view, this adjustment is not appropriate when estimating theta as the *value* of distributed imputation credits. When theta takes a *value* interpretation within the regulatory framework, what is required is an estimate of the price that investors would be prepared to pay for an imputation credit. This is because the allowed return for an investor will be reduced by theta for every dollar of imputation credits that is distributed to them. To preserve the appropriate return to investors, the regulatory framework must reduce the return to investors by an amount that is equivalent to the price investors would be prepared to pay for the credit. Dividend drop-off analysis is specifically designed to estimate the price that investors would be prepared to pay for imputation credits. It directly estimates the extent to which imputation credits are capitalised into the stock price. This is an estimate of how much the stock price has been bid up in relation to the imputation credit that is to be received. The standard dividend drop-off estimate of theta provides a direct estimate of the *value* of distributed credits.

[109] Jemena Draft Decision, Attachment 4, p. 23.

*The proposed adjustment produces perverse outcomes*

189. Moreover, the proposed scaling has perverse outcomes. To see this, first recall that the proposed adjustment is to divide theta by the estimated value of cash dividends, which can be defined as $\delta$. Suppose the regulator applies the scaling approach, but that the dividend drop-off analysis suggests that $\delta = 1$, so that the scaling has no effect. The regulator then determines the allowed revenue for the firm of say $X.

190. Now consider a case that is identical in all respects to the one above, except that the drop-off analysis produces an estimate of $\delta < 1$. In this case, *everything* is identical to the previous case, except that shareholders do not value dividends as highly. If anything, this should require an increase in the allowed revenues – because shareholders do not value dividends as highly, they would need to receive more of them in order to be left equally well off.[110] However, under the proposed approach the drop-off estimate of theta would be increased (by dividing by $\delta < 1$) which would in turn result in *lower* allowed revenues.

191. Under the AER's proposed approach, as the dividends paid by the firm become less valuable to investors, the allowed revenues are further reduced – which is the exact opposite of what should occur.

*The proposed adjustment would need to apply throughout the regulatory process*

192. In using the Sharpe-Lintner CAPM to estimate the required return on equity, the AER imposes an estimate of $\delta = 1$ – it estimates the required return on the basis that shareholders value dividends at their full face value. There are more complex versions of the CAPM that allow for $\delta < 1$, but the AER does not use them. For example, Lally and van Zijl (2003) develop a version of the CAPM that allows for the case where $\delta < 1$. These more complex models simplify to the Sharpe-Lintner CAPM for the case where $\delta = 1$.

193. It would be inconsistent and wrong for a regulator to adjust the estimate of theta on the basis that $\delta < 1$, but then to estimate the required return on equity in the same WACC estimation process on the basis that $\delta = 1$. That is, if $\delta < 1$ when estimating theta, then $\delta < 1$ should apply throughout the WACC estimation process.

*Summary and recommendations*

194. In my view, the proposed scaling adjustment should not be applied. The drop-off estimate of theta already provides a direct estimate of the value of distributed credits, and the adjustment would have the perverse effect of *reducing* the allowed revenues as dividends become less valuable.

195. If, however, a particular value of $\delta < 1$ is to be used to adjust the estimate of theta, consistency requires that the same value of $\delta < 1$ would have to be used throughout the WACC estimation process. It would be inconsistent and wrong to estimate theta on the basis that $\delta < 1$ and $r_e$ on the basis that $\delta = 1$ in the same WACC estimation process.

[110] See for example, Lally and van Zijl (2003).

# 8. The distribution rate

## Guideline estimates

### AER Guideline estimate is 0.7

196. The AER reaffirmed its use of a distribution rate of 0.7 in its Rate of Return Guideline. The AER uses the term "payout ratio" and states that:

> The payout ratio would be estimated using the cumulative payout ratio approach. The cumulative payout ratio is an estimate of the average payout rate from 1987, when the imputation system began, to the latest year for which tax data is available. Based on current evidence, this leads to an estimate of 0.7.[111]

197. The AER also states that some of the advantages of this accepted approach for estimating the distribution rate are that it:

> is simple and intuitive, uses long-term, published data, and is supported by stakeholders and an expert review from Lally.[112]

### Australian Competition Tribunal estimate is 0.7

198. The Australian Competition Tribunal has recently adopted a distribution rate of 0.7:

> the Tribunal concludes that the distribution ratio is 0.7 for the calculation of gamma.[113]

### The ERA estimate is 0.7

199. In its final Guideline, the ERA also proposes to use an estimate of 70% for the distribution rate, or "payout ratio" as the ERA refers to it.[114]

### McKenzie and Partington estimate is 0.7

200. In their recent report for the QRC, McKenzie and Partington (2013) use the term "access fraction" and state that:

> There is less debate about the magnitude of the access fraction as this can be measured reasonably well from taxation statistics and a value of 70% is widely accepted as the proportion of credits created that are distributed.[115]

### Service providers adopted the Guideline estimate of 0.7

201. All of the service providers that are the subject of the AER's recent draft decisions accepted the Guideline distribution rate of 0.7.

[111] AER Rate of Return Guideline, p. 23.
[112] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[113] Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT 9 (24 December 2010), Paragraph 4.
[114] ERA, Rate of Return Guideline, p. 9.
[115] McKenzie and Partington, (2013 QCA), p. 31.

### Recent draft decision estimates

202. In its recent draft decisions, the AER states that it has considered:

a) "The widely accepted approach to estimating the distribution rate," which produces an estimate of 0.7, as set out above; and

b) An additional "range of approaches."[116]

203. The estimates that have been considered by the AER are:

a) The "widely accepted" estimate of 0.7. This estimate is obtained by applying the "cumulative payout ratio approach," which involves taking the ratio of (a) the total amount of imputation credits distributed over a period, to (b) the total amount of corporate tax paid over the same period. Aggregated ATO tax statistic data is used for this purpose. The amount of distributed credits is estimated with reference to the ATO's Franking Account Balance (FAB) data. NERA (2013), Hathaway (2013) and Handley (2014) all provide estimates of approximately 0.7 using this approach.[117]

b) An estimate of 0.5 from Hathaway (2013) and NERA (2013), obtained by estimating the amount of distributed credits from the ATO's corporate tax return data.[118]

c) An estimate of 0.8 from Handley (2014), obtained by applying the cumulative payout ratio approach to data for public companies only. This estimate is based on data from 1987-2011.[119]

d) An estimate of 0.84 from Lally (2013), obtained by analysing the annual reports of 20 listed companies.[120]

204. In summary, the AER's rate of Return Guideline adopted the "widely accepted" estimate of 0.7 for the distribution rate parameter. All service providers who have submitted since the Guideline have accepted the Guideline estimate of 0.7. Now, in a series of draft decisions, the AER has departed from its Guideline estimate by expanding the range for the distribution rate to 0.7-0.8 based on:

a) An analysis from Handley (2014) that uses ATO data for listed firms; and

b) An estimate from Lally (2014 QCA) that is based on a methodology that he has espoused for over 10 years and which was rejected by the AER in its 2013 Guideline.

### Issues for consideration

#### Different estimates from ATO data

205. The first issue to consider is that the ATO data produces two materially different estimates of the distribution rate: 0.7 when the franking account balance data is used and 0.5 when the corporate tax return data is used. The AER also uses ATO data to estimate the redemption rate. This involves estimating the quantum of credits that were redeemed over some period and dividing by the quantum

[116] Jemena Draft Decision, Appendix 4, p. 8.
[117] Jemena Draft Decision, Appendix 4, p. 16.
[118] Jemena Draft Decision, Appendix 4, p. 51.
[119] Jemena Draft Decision, Appendix 4, p. 26.
[120] Jemena Draft Decision, Appendix 4, p. 26.

of credits that were distributed over that same period. In this case, the quantum of distributed credits appears in the numerator of the distribution rate and in the denominator of the redemption rate. Clearly, the same estimate must be used in both places. The AER reports that: [121]

a) The franking account balance supports estimates of 0.7 for the distribution rate and 0.43 for the redemption rate; and

b) The corporate tax return data supports estimates of 0.5 for the distribution rate and 0.61 for the redemption rate.

206. In its recent draft decisions, the AER notes that Hathaway (2013) expresses concerns about the ATO corporate tax return (dividend) data:

> I have more faith in the [franking account balance] data than in the dividend data. The dividend data appears to be missing about $87.5 billion and the ATO has had substantial problems with the dividend data in the past. [122]

and this leads the AER to adopt the estimates of 0.7 and 0.43 based on the franking account balance data, which I consider to be a reasonable approach.

### Correspondence between estimates

207. As set out above, the AER notes that its tax statistics estimates of the distribution rate and the redemption rate both require an estimate of the quantum of distributed credits. The AER also correctly notes that internal consistency requires that the same estimate must be adopted in both places where it is used.

208. This can be distinguished from the case where theta is interpreted as the value (as in "worth to investors") of imputation credits rather than as the redemption rate. Market value estimates of theta are entirely independent of the distribution rate. Whereas the tax statistics estimate of the redemption rate requires, as an input, a tax statistics estimate of the distribution rate, the same is not true of market value estimates. Market value studies estimate the value of credits that are known to have been distributed. For example, dividend drop-off studies examine dividend payments where the degree of franking is known with certainty.

### Market-wide or benchmark efficient entity parameter?

209. As set out above, my view is that theta should be interpreted as the value (as in "worth to investors") of distributed credits, which reflects the extent to which those credits are capitalised into stock prices. Since all credits from all companies are identical, it must be the case that, in equilibrium, the credits have the same value throughout the economy. Consequently, it is generally accepted that theta is a market-wide parameter – with a single value that would apply to all firms.

210. By contrast, it is quite possible that different firms might distribute different proportions of the credits that they create by paying corporate tax in Australia. Since credits can only be distributed by attaching them to dividends, and because different firms have different dividend policies, the imputation credit distribution rate will differ across firms.

[121] Jemena Draft Decision, Appendix 4, p. 59.
[122] Jemena Draft Decision, Appendix 4, p. 51.

211. Conceptually, the task is to estimate theta using broad market data (as set out in the previous sections of this report) and to estimate the distribution rate for the benchmark efficient firm. I note that Lally (2013 AER) has recently reached the same conclusion. He refers to the use of aggregate ATO data and concludes that:

> However this approach yields a market average. By contrast, within the Officer (1994) model, the distribution rate is a firm specific parameter rather than a market average parameter. [123]

212. The primary evidence about the distribution rate for the benchmark efficient firm would be the actual practice of service providers. Of course, those service providers that are state-owned do not create or distribute any imputation credits because they do not pay corporate tax to the Commonwealth. Due to their ownership structures and tax positions, many privately owned service providers distribute materially less than 70% of the imputation credits that they create. Lally (2013) recommends against using observations from actual service providers to estimate an industry distribution rate on the basis that service providers would then have an incentive to manipulate their dividend policies to influence the regulator's estimate of gamma.[124] In my view, it is highly unlikely that any service provider would materially reduce its dividend payout rate for the purpose of influencing the regulatory estimate of gamma. One can only imagine a CEO explaining to investors that their dividends have been slashed in order to trick the regulator into adopting a lower estimate of gamma. Moreover, no such incentive has existed to date, in which case the past (low) distribution rates for service providers would not be contaminated. Also, the sample could be expanded to include other comparable infrastructure-type firms that are not subject to regulation by the AER – similar to the approach used to estimate other WACC parameters.[125]

213. A proper review of the distribution rate parameter would have to consider whether it should be estimated as a market-wide parameter or with reference to the efficient benchmark entity, and the implications this has for the techniques and data sources that might be used.

### Estimates for the benchmark firm

214. The evidence that has been considered by the AER suggests that distribution rates vary by firm size and type. Lally (2014 QCA) reports that 20 firms that collectively represent 62% of the Australian stock market[126] have a distribution rate of 84%. Handley (2014) reports that all public firms have a distribution rate of 80%. This implies that the public firms that are not among the top 20 have an average distribution rate of 73% since:

$$73\% \times 0.38 + 84\% \times 0.62 = 80\%.$$

215. The 20 firms in the Lally sample are very large multinationals. For example, BHP has equity that is valued at more than 30 times the equity in the regulated asset base of even a large service provider.[127] Even the smallest of the companies in the Lally sample are orders of magnitude larger than the service providers that are regulated by the AER.[128] Consequently, firms outside of the Lally sample

[123] Lally (2013 AER), p. 41.
[124] Lally (2013 AER), p. 42.
[125] I am conducting such analysis in ongoing work now that the distribution rate is the subject of renewed consideration.
[126] More properly, 62% of corporate tax payments.
[127] A service provider with a $10 billion RAB would be considered to be large. Such a service provider would have $4 billion of equity. BHP has a market capitalisation of over $122 billion.
[128] For example, Amcor has a market capitalisation of approximately $16 billion.

would seem to be more representative of the benchmark efficient entity and those firms have a distribution rate of 73% according to the Handley and Lally figures.[129]

216. If theta is estimated using a market value approach, the estimate will represent an average across all listed firms. For example, other things being equal, one can learn as much about the market value of a distributed credit from an ex-dividend event from a smaller firm as from BHP. However, the Handley/Lally estimates are dominated by very large firms, which introduces a potential mis-match between the estimates of the two components of gamma. This is another issue that would require careful consideration.

### The existence of foreign profits

217. Another point to consider is that the 20 firms in the Lally sample are large multinationals with material amounts of income that have been generated and taxed in foreign jurisdictions. Foreign profits enable these large firms to increase the proportion of imputation credits they distribute. For example, consider two firms that each earn a $100 profit and each pay $30 of corporate tax and each seek to pay a $50 dividend out of the after-tax profit of $70. One of the firms is entirely domestic and the other has 20% of its profits (and taxes) outside Australia. The relevant calculations are set out in Table 3 below. In both cases, the firm pays a fully-franked dividend of $50, which has imputation credits of $21.43 attached to it.[130] This amounts to a distribution rate of 71% for the domestic firm and 89% for the multi-national firm. It is the foreign-sourced profits that inflate the distribution rate for the multi-national firm. These foreign profits make up part of the cash dividend, but they do not create imputation credits.

**Table 3**
**Distribution rates for domestic and multi-national firms**

| | Domestic firm | Multi-national firm |
|---|---|---|
| Domestic profit | 100 | 80 |
| Foreign profit | 0 | 20 |
| Total profit | 100 | 100 |
| Domestic tax (30%) (and imputation credits created) | 30 | 24 |
| Foreign tax (30%) | 0 | 6 |
| Total tax | 30 | 30 |
| After-tax profit | 70 | 70 |
| Dividend paid (fully-franked) | 50 | 50 |
| Imputation credits attached to dividend | 21.43 | 21.43 |
| Distribution rate | 71% | 89% |

218. The benchmark efficient entity, by definition, has no foreign-sourced profits that can be used to inflate its distribution rate. Indeed the AER's post-tax revenue model assumes that every dollar of profit is taxed in Australian and generates $0.30 of imputation credits. Consequently, the extent to which the multi-national firms in the Lally sample are able to attach imputation credits to their

[129] Of course, there are also some listed firms that are much smaller than the service providers that are regulated by the AER. However, very small firms pay very little tax and therefore do not materially affect the average, which is weighted according to the amount of tax paid.
[130] The proportion of imputation credits relative to the cash dividend is T/(1-T)=0.3/(1-0.3)=0.43.

domestic- and foreign-sourced dividends would not seem to be relevant to the benchmark efficient entity.

219. In my view, this is a very important issue that requires careful consideration. Since the PTRM models all tax payments as creating imputation credits, it may be more relevant to define the distribution rate relative to tax paid rather than relative to credits created. For example, the QCA adopts that definition. In that case, the Handley/Lally figures would represent upper bounds, rather than point estimates, for the distribution rate.

### The appropriate data

220. The Handley (2014) estimate of 0.8 for public companies is based on data from 1987-2011. In its recent draft decisions, the AER has stated that:

> We now consider that greater reliance should be placed upon estimates that are derived from post-2004 data, consistent with Hathaway's findings that the ATO statistics are subject to a number of issues prior to 2004. [131]

221. Consideration should be given to the question of whether the problems that contaminate the pre-2004 data extend to the data required for the estimation of the distribution rate, and if so whether the inclusion of the 1987-2003 data materially affects that estimate. At this stage, the AER has available to it only a single over-all figure from Handley (2014).

222. There is also a question about whether data should be restricted to listed firms or whether it should be expanded to include private firms as well. Since the benchmark efficient entity is not necessarily listed, this would imply that private firms are also relevant. For the same reason that very large multinational firms are not comparable to the benchmark efficient entity, very small private firms would also not be close comparators. That is, the task would not involve estimating separate distribution rates for the average listed firm and the average private firm, the task would be to estimate the distribution rate for the benchmark efficient entity, which may be listed or private. For some WACC parameters (e.g., beta) data is restricted to listed firms because the required data is not available for unlisted firms, and for other estimation tasks (e.g., the raw equity ownership data) the unlisted data includes government entities such as local government and the central bank. For the distribution rate, however, the ATO provides the same data for listed and private firms, and any of this data that informs the distribution rate for the benchmark efficient entity could be used.

### Summary and conclusions

223. My view is that, having regard to the range of issues set out above:

a) The best estimate of the distribution rate for the benchmark efficient entity from the Handley (2014) and Lally (2014 QCA) analysis (which considers listed firms only) is not materially different from the "widely accepted" estimate of 70%;

b) That estimate is over-stated to the extent that foreign-sourced income enables large public companies to distribute a higher proportion of imputation credits because the benchmark efficient entity has no access to foreign-sourced income; and

c) The 80% estimate that the AER adopts for listed firms implicitly assumes that the benchmark efficient entity would be able to use foreign-sourced profits to enable it to

[131] Jemena Draft Decision, Appendix 4, p. 20.

distribute a higher proportion of foreign-sourced profits, when no such foreign-sourced profits would be available to it.

224. In my view, the "widely accepted" estimate of 70% is a conservative estimate of the distribution rate for the benchmark efficient entity and, for the reasons set out in the preceding paragraph, there is no reasonable basis to increase it to 0.8 even if the data is restricted to listed firms only.

## 9. Declaration

225. I confirm that I have made all the inquiries 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.

Professor Stephen Gray

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## Appendix 1: Instructions

# Expert Terms of Reference

# Estimating the value of imputation credits

## Jemena Gas Networks
## 2015-20 Access Arrangement Review

## AA15-570-0060

## Version C – 6 February 2015

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# Contents

# 1 Background

Jemena Gas Networks (**JGN**) is the major gas distribution service provider in New South Wales (**NSW**). JGN owns more than 25,000 kilometres of natural gas distribution system, delivering approximately 100 petajoules of natural gas to over one million homes, businesses and large industrial consumers across NSW.

JGN submitted its revised Access Arrangement proposal (proposal) with supporting information for the consideration of the Australian Energy Regulator (**AER**) on 30 June 2014. The revised access arrangement will cover the period 1 July 2015 to 30 June 2020 (July to June financial years). The AER published its draft decision on this proposal on 27 November 2014. JGN must submit any additions or other amendments to its proposal by 27 February 2015.

As with all of its economic regulatory functions and powers, when assessing JGN's revised Access Arrangement under the National Gas Rules and National Gas Law, the AER is required to do so in a manner that will or is likely to contribute to the achievement of the National Gas Objective, which is:

> "to promote efficient investment in, and efficient operation and use of, natural gas services for the long term interests of consumers of natural gas with respect to price, quality, safety, reliability and security of supply of natural gas."

For electricity networks, the AER must assess regulatory proposals under the National Electricity Rules and the National Electricity Law in a manner that will or is likely to achieve the National Electricity Objective, as stated in section 7 of the National Electricity Law.

Where there are two or more possible decisions in relation to JGN's revised Access Arrangement that will or are likely to contribute to the achievement of the National Gas Objective, the AER is required to make the decision that the AER is satisfied will or is likely to contribute to the achievement of the National Gas Objective to the greatest degree.

The AER must also take into account the revenue and pricing principles in section 24 of the National Gas Law when exercising a discretion in relation to those parts of JGN's revised Access Arrangement relating to reference tariffs. The revenue and pricing principles include the following:

> "(2) A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—
>
> (a) providing reference services; and
>
> (b) complying with a regulatory obligation or requirement or making a regulatory payment.
>
> (3) A service provider should be provided with effective incentives in order to promote economic efficiency with respect to reference services the service provider provides. The economic efficiency that should be promoted includes—
>
> (a) efficient investment in, or in connection with, a pipeline with which the service provider provides reference services…

[…]

(5) A reference tariff should allow for a return commensurate with the regulatory and commercial risks involved in providing the reference service to which that tariff relates.

(6) Regard should be had to the economic costs and risks of the potential for under and over investment by a service provider in a pipeline with which the service provider provides pipeline services."

Some of the key rules that are relevant to an access arrangement and its assessment are set out below.

Rule 74 of the National Gas Rules, relating generally to forecasts and estimates, states:

"(1) Information in the nature of a forecast or estimate must be supported by a statement of the basis of the forecast or estimate.

(2) A forecast or estimate:

(a) must be arrived at on a reasonable basis; and

(b) must represent the best forecast or estimate possible in the circumstances."

Rule 76 of the National Gas Rules sets out how total revenue for a regulated service provider is to be calculated adopting a "building block approach". it provides:

"Total revenue is to be determined for each regulatory year of the *access arrangement period* using the building block approach in which the building blocks are:

(a) a return on the projected capital base for the year (See Divisions 4 and 5);

(b) depreciation on the projected capital base for the year (See Division 6);

(c) the estimated cost of corporate income tax for the year (See Division 5A);

(d) increments or decrements for the year resulting from the operation of an incentive mechanism to encourage gains in efficiency (See Division 9); and

(e) a forecast of operating expenditure for the year (See Division 7)."

The equivalent National Electricity Rules are in clauses 6A.5.4(a) (for electricity transmission) and 6.4.3(a) (for electricity distribution).

Rule 87 of the National Gas Rules, relating to the allowed rate of return, states:

(1) Subject to rule 82(3), the return on the projected capital base for each regulatory year of the access arrangement period is to be calculated by applying a rate of return that is determined in accordance with this rule 87 (the allowed rate of return).

(2) The allowed rate of return is to be determined such that it achieves the allowed rate of return objective.

(3) The allowed rate of return objective is that the rate of return for a service provider is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the service provider in respect of the provision of reference services (the allowed rate of return objective).

(4) Subject to subrule (2), the allowed rate of return for a regulatory year is to be:

(a) a weighted average of the return on equity for the access arrangement period in which that regulatory year occurs (as estimated under subrule (6)) and the return on debt for that regulatory year (as estimated under subrule (8)); and

(b) determined on a nominal vanilla basis that is consistent with the estimate of the value of imputation credits referred to in rule 87A.

(5) In determining the allowed rate of return, regard must be had to:

(a) relevant estimation methods, financial models, market data and other evidence;

(b) the desirability of using an approach that leads to the consistent application of any estimates of financial parameters that are relevant to the estimates of, and that are common to, the return on equity and the return on debt; and

(c) any interrelationships between estimates of financial parameters that are relevant to the estimates of the return on equity and the return on debt.

*Return on equity*

(6) The return on equity for an access arrangement period is to be estimated such that it contributes to the achievement of the allowed rate of return objective.

(7) In estimating the return on equity under subrule (6), regard must be had to the prevailing conditions in the market for equity funds.

[Subrules (8)–(19) omitted].

The equivalent National Electricity Rules are in clauses 6A.6.2 (for electricity transmission) and 6.5.2 (for electricity distribution).

Rule 87A of the National Gas Rules, relating to the estimated cost of corporate income tax, states:

> "The estimated cost of corporate income tax of a service provider for each regulatory year of an access arrangement period ($ETC_t$) is to be estimated in accordance with the following formula:
>
> $ETC_t = (ETIt \times r_t)\ (1 - \gamma)$
>
> Where

$ETI_t$ is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of reference services if such an entity, rather than the service provider, operated the business of the service provider;

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

γ is the value of imputation credits."

The equivalent National Electricity Rules are in clauses 6A.6.4 (for electricity transmission) and 6.5.3 (for electricity distribution).

In its proposal, JGN submitted the expert report of SFG (the **Earlier Report**), as a suitable qualified independent expert (**Expert**), on the value of imputation credits (γ or gamma) to be applied in estimating the cost of corporate income tax.[1] The AER draft decision considered this report.

In this context, JGN seeks a further opinion of SFG that reviews and, where appropriate, responds to matters raised in the draft decision on the value of imputation credits. JGN seeks this report on behalf of itself, Jemena Electricity Networks, ActewAGL, Ausgrid, Ausnet Services, Australian Gas Networks, Citipower, Directlink, Endeavour Energy, ENERGEX, Ergon, Essential Energy, Powercor, SA Power Networks, and United Energy.

# 2 Scope of Work

The Expert will provide an opinion report that:

1. Reviews and responds, where appropriate, to matters raised in the draft decision on the value to be adopted for imputation credits, including (but not limited to):

   (a) the appropriate distribution rate or rates for listed and non-listed firms;
   whether the most relevant measure for the distribution rate is listed or non-listed firms;

   (b) the conceptual definition of theta, including whether there is a relationship between the value of imputation credits and the return on equity and if so, the nature of that relationship in the context of the regulatory framework:

   (c) the use of equity ownership statistics, tax statistics and market studies to estimate theta and the reliability of estimates from each;

   (d) whether adjustments are needed to dividend drop-off study estimates for the cash value of dividends and, if so, what those adjustments are;

   (e) whether and, if so, why, an investor that can and/or does use imputation credits may value them at less than their face value; and

[1] *SFG*, 21 May 2014, *An appropriate regulatory estimate of gamma*.

2. In light of Expert's opinion on the above matters, and any other matters the Expert considers relevant, and the Earlier Report, sets out the Expert's best estimate of the value of imputation credits in the context of the relevant regulatory frameworks.

In preparing the report the Expert will:

A. consider possible alternative positions to what measure is sought to be captured in the gamma parameter, in particular the position of the AER in the rate of return guidelines;

B. consider possible alternative methods and approaches to estimating the value of imputation credits, including those previously considered by the AER and other regulators;

C. consider the theoretical and empirical support for each of the possible approaches;

D. consider any comments raised by the AER and other regulators, and experts engaged by those regulators on (a) the appropriateness of alternative methods for estimating the value of imputation credits; and (b) the statistical reliability of the estimates produced by those approaches; and

E. use robust methods and data in producing any statistical estimates.

# 3 Information to be Considered

The Expert is also expected to consider the following information:

- such information that, in Expert's opinion, should be taken into account to address the questions outlined above;
- relevant literature on the value of imputation credits;
- the AER's Rate of Return Guideline, including explanatory statements and supporting expert material;
- material submitted to the AER as part of its consultation on the Rate of Return Guidelines; and
- previous decisions of the AER, other relevant regulators and the Australian Competition Tribunal on the value of imputation credits and any supporting expert material, including the recent draft decisions for JGN and electricity networks in ACT, NSW and Tasmania.

# 4 Deliverables

At the completion of its review the Expert will provide an independent expert report which:

- is of a professional standard capable of being submitted to the AER;

- is prepared in accordance with the Federal Court Practice Note on Expert Witnesses in Proceedings in the Federal Court of Australia (CM 7) set out in Attachment 1, and includes an acknowledgement that the Expert has read the guidelines [2];

- contains a section summarising the Expert's experience and qualifications, and attaches the Expert's curriculum vitae (preferably in a schedule or annexure);

- identifies any person and their qualifications, who assists the Expert in preparing the report or in carrying out any research or test for the purposes of the report;

- summarises JGN's instructions and attaches these term of reference;

- includes an executive summary which highlights key aspects of the Expert's work and conclusions; and

- (without limiting the points above) carefully sets out the facts that the Expert has assumed in putting together his or her report, as well as identifying any other assumptions made, and the basis for those assumptions.

The Expert's report will include the findings for each of the five parts defined in the scope of works (Section 2).

# 5 Timetable

The Expert will deliver the final report to Jemena Regulation by **6 February 2015**.

# 6 Terms of Engagement

The terms on which the Expert will be engaged to provide the requested advice shall be:

- as provided in accordance with the Jemena Regulatory Consultancy Services Panel arrangements applicable to the Expert.

[2] Available at: http://www.federalcourt.gov.au/law-and-practice/practice-documents/practice-notes/cm7.

# ATTACHMENT 1: FEDERAL COURT PRACTICE NOTE

## Practice Note CM 7

**EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA**

### 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[3], 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[4]

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[5]

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

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[3] 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].

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

[5] Rule 23.13.

(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[6]; 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[7].

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[8].

## 3. Experts' Conference

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

J L B ALLSOP
Chief Justice
4 June 2013

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

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

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

## Appendix 2: Curriculum vitae of Professor Stephen Gray

# Stephen F. Gray

University of Queensland
Business School
Brisbane 4072
AUSTRALIA
Office: +61-7-3346 8032
Email: s.gray@business.uq.edu.au

## 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., I. Harymawan and J. Nowland, (2014), "Political and government connections on corporate boards in Australia: Good for business?" *Australian Journal of Management,* forthcoming.

Brailsford, T., S. Gray and S. Treepongkaruna, (2013), "Explaining the bid-ask spread in the foreign exchange market: A test of alternate models," *Australian Journal of Management,* forthcoming.

Faff, R., S. Gray and M. Poulsen, (2013), "Financial inflexibility and the value premium," *International Review of Finance,* forthcoming.

T. Fitzgerald, S. Gray, J. Hall and R. Jeyaraj, (2013), "Unconstrained estimates of the equity risk premium" *Review of Accounting Studies,* 18, 560-639.

Gray, S. and J. Nowland, (2013), "Is prior director experience valuable?" *Accounting and Finance,* 53, 643-666.

Chen, E. T., S. Gray and J. Nowland, (2012), "Family representatives in family firms" *Corporate Governance: An International Review*, 21(3), 242-263.

Treepongkaruna, S., R. Brooks and S. Gray, (2012), "Do Trading Hours Affect Volatility Links in the Foreign Exchange Market?" *Australian Journal of Management*, 37, 7-27.

Chen, E. T., S. Gray and J. Nowland, (2012), "Multiple founders and firm value" *Pacific Basin Finance Journal*, 20, 3, 398-415.

Chan, K-F., R. Brooks, S. Treepongkaruna and S. Gray, (2011), "Asset market linkages: Evidence from financial, commodity and real estate assets," *Journal of Banking and Finance*, 35, 6, 1415-1426.

Parmenter, B, A. Breckenridge, and S. Gray, (2010), 'Economic Analysis of the Government's Recent Mining Tax Proposals', *Economic Papers*: *A Journal of Economics and Policy*, 29(3), September, 279-91.

Gray, S., C. Gaunt and Y. Wu, (2010), "A comparison of alternative bankruptcy prediction models," *Journal of Contemporary Accounting and Economics*, 6, 1, 34-45.

Feuerherdt, C., S. Gray and J. Hall, (2010), "The Value of Imputation Tax Credits on Australian Hybrid Securities," *International Review of Finance*, 10, 3, 365-401.

Gray, S., J. Hall, D. Klease and A. McCrystal, (2009), "Bias, stability and predictive ability in the measurement of systematic risk," *Accounting Research Journal*, 22, 3, 220-236.

Treepongkaruna, S. and S. Gray, (2009), "Information volatility links in the foreign exchange market," *Accounting and Finance*, 49, 2, 385-405.

Costello, D., S. Gray, and A. McCrystal, (2008), "The diversification benefits of Australian equities," *JASSA*, 2008, 4, 31-35.

Gray, S. and J. Hall, (2008), "The Relationship Between Franking Credits and the Market Risk Premium: A Reply," *Accounting and Finance*, 48, 1, 133-142.

Gray, S., A. Mirkovic and V. Ragunathan, (2006), "The Determinants of Credit Ratings: Australian Evidence," *Australian Journal of Management,* 31(2), 333-354.

Choy, E., S. Gray and V. Ragunathan, (2006), "The Effect of Credit Rating Changes on Australian Stock Returns," *Accounting and Finance*, 46(5), 755-769.

Gray, S. and J. Hall, (2006), "The Relationship Between Franking Credits and the Market Risk Premium," *Accounting and Finance*, 46(3), 405-428.

Gray, S. and S. Treepongkaruna, (2006), "Are there non-linearities in short-term interest rates?" *Accounting and Finance*, 46(1), 149-167.

Gray, P., S. Gray and T. Roche, (2005), "A Note on the Efficiency in Football Betting Markets: The Economic Significance of Trading Strategies," *Accounting and Finance*, 45(2) 269-281.

Duffie, D., S. Gray and P. Hoang, (2004), "Volatility in Energy Prices. In V. Kaminski," (Ed.), *Managing Energy Price Risk: The New Challenges and Solutions* (3rd ed.). London: Risk Books.

Cannavan, D., F. Finn and S. Gray, (2004), "The Value of Dividend Imputation Tax Credits in Australia," *Journal of Financial Economics*, 73, 167-197.

Gray, S. and S. Treepongkaruna, (2003), "Valuing Interest Rate Derivatives Using a Monte-Carlo Approach," *Accounting and Finance*, 43(2), 231-259.

Gray, S., T. Smith and R. Whaley, (2003), "Stock Splits: Implications for Investor Trading Costs," *Journal of Empirical Finance*, 10, 271-303.

Gray, S. and S. Treepongkaruna, (2003), "On the Robustness of Short-term Interest Rate Models," *Accounting and Finance*, 43(1), 87-121.

Gray, S. and S. Treepongkaruna, (2002), "How to Value Interest Rate Derivatives in a No-Arbitrage Setting," *Accounting Research Journal* (15), 1.

Gray, P. and S. Gray, (2001), "A Framework for Valuing Derivative Securities," *Financial Markets Institutions & Instruments*, 10(5), 253-276.

Gray, P. and S. Gray, (2001), "Option Pricing: A Synthesis of Alternate Approaches," *Accounting Research Journal*, 14(1), 75-83.

Dahlquist, M. and S. Gray, (2000), "Regime-Switching and Interest Rates in the European Monetary System," *Journal of International Economics*, 50(2), 399-419.

Bollen, N., S. Gray and R. Whaley, (2000), "Regime-Switching in Foreign Exchange Rates: Evidence from Currency Options," *Journal of Econometrics*, 94, 239-276.

Duffie, D., S. Gray and P. Hoang, (1999), "Volatility in Energy Prices. In R. Jameson," (Ed.), *Managing Energy Price Risk* (2nd ed.). London: Risk Publications.

Gray, S. and R. Whaley, (1999), "Reset Put Options: Valuation, Risk Characteristics, and an Example," *Australian Journal of Management*, 24(1), 1-21.

Bekaert, G. and S. Gray, (1998), "Target Zones and Exchange Rates: An Empirical Investigation," *Journal of International Economics*, 45(1), 1-35.

Gray, S. and R. Whaley, (1997), "Valuing S&P 500 Bear Market Warrants with a Periodic Reset," *Journal of Derivatives*, 5(1), 99-106.

Gray, S. and P. Gray, (1997), "Testing Market Efficiency: Evidence from the NFL Sports Betting Market," *The Journal of Finance*, 52(4), 1725-1737.

Gray, S. (1996), "Modeling the Conditional Distribution of Interest Rates as a Regime- Switching Process," *Journal of Financial Economics*, 42, 27-62.

Gray, S. (1996), "Regime-Switching in Australian Interest Rates," *Accounting and Finance*, 36(1), 65-88.

Brailsford, T., S. Easton, P.Gray and S. Gray, (1995), "The Efficiency of Australian Football Betting Markets," *Australian Journal of Management*, 20(2), 167-196.

Duffie, D. and S. Gray, (1995), "Volatility in Energy Prices," In R. Jameson (Ed.), *Managing Energy Price Risk*, London: Risk Publications.

Gray, S. and A. Lynch, (1990), "An Alternative Explanation of the January Anomaly," *Accounting Research Journal*, 3(1), 19-27.

Gray, S. (1989), "Put Call Parity: An Extension of Boundary Conditions," *Australian Journal of Management*, 14(2), 151-170.

Gray, S. (1988), "The Straddle and the Efficiency of the Australian Exchange Traded Options Market," *Accounting Research Journal*, 1(2), 15-27.

**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.