An appropriate regulatory estimate of gamma

Report for Jemena Gas Networks, ActewAGL, APA, Networks NSW (Ausgrid, Endeavour Energy and Essential Energy), ENERGEX, Ergon, Transend, TransGrid and SA Power Networks

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1. Background and conclusions

Overview and instructions

1. SFG Consulting (**SFG**) has been retained by Jemena Gas Networks, ActewAGL, APA, Networks NSW (Ausgrid, Endeavour Energy and Essential Energy), ENERGEX, Ergon, Transend, TransGrid and SA Power Networks to provide our views on the estimation of the gamma parameter in the context of regulatory weighted-average cost of capital (**WACC**) estimation.

2. In particular, we have been asked to:

   a) Describe the conceptual economic / finance basis for accounting for the value of imputation credits when estimating the cost of corporate income tax as part of a post-tax building block revenue framework where the building blocks are as set out in rule 76 (for gas distribution and transmission), clause 6A.5.4(a) (for electricity transmission), and clause 6.4.3(a) (for electricity distribution);

   b) Assess each of the methods identified by the AER for estimating the value of imputation credits in the Rate of Return Guideline, as well as any other methods we consider to be relevant, in terms of:

      i) their suitability for estimating the value of imputation credits within the building block revenue framework, in light of the conceptual economic / finance basis for this parameter; and

      ii) the reliability and robustness of estimates produced by each method;

   c) Provide our opinion on the best method, or combination of methods, for estimating the value of imputation credits within the building block revenue framework; and

   d) Provide an estimate of the value of imputation credits, based on the recommended method, or combination of methods.

3. Our instructions are set out in Appendix 1 to this report.

4. 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.

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

6. 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

7. Our primary conclusions are set out below.

The economic role of gamma in the regulatory process

8. Gamma represents the value of imputation credits to investors. It determines the proportion of the return to shareholders that is assumed to come from imputation credits.[1]

9. The parameter estimates set out in the Guideline imply that the allowed revenue should be set so that the firm is able to provide 82% of the total return that is required by shareholders, the other 18% being assumed to come from the value of imputation credits. That is, the allowed return on equity is reduced by 18% in relation to the assumed value of imputation credits.

10. If shareholders value imputation credits less than the 18% reduction in their allowed return, they will be under-compensated for the risk they bear.

The economic role of theta in the regulatory process

11. Gamma is estimated as the product of the distribution rate (*F*) and the value of distributed credits (theta). This is standard regulatory practice.[2]

12. Theta represents the value (to the market) of a distributed imputation credit. It represents the extent to which a distributed credit is reflected in the share price.

The distribution rate

13. Our main conclusions in relation to the distribution rate are:[3]

    a) The accepted empirical approach consistently produces an estimate of 0.7;

    b) Standard Australian regulatory practice is to adopt a distribution rate of 0.7;

    c) All stakeholders have proposed a distribution rate of 0.7;

    d) The Lally small sample approach should receive no weight because:

        i) It produces highly variable estimates over time, including materially different recommendations two days apart, whereas the accepted approach produces stable estimates;

        ii) The Lally approach is motivated only by unspecified problems with the ATO data. Whereas there are known to be problems with ATO dividend flow data, no issues have been raised in relation to the franking account balance data that is used to estimate the distribution rate; and

        iii) The small sample of firms used in the Lally approach are not indicative of either the average firm or the benchmark regulated firm; and

    e) For the reasons set out above, we concur with the distribution rate of 0.7 that is proposed in the Guideline.

[1] See Section 2 of this report.
[2] See Section 2 of this report.
[3] See Section 3 of this report.

Value vs. redemption

14. Investors are likely to value imputation credits at less than their face value for a number of reasons:[4]

    a) Credits that are not redeemed (because they are distributed to non-residents, or they are excluded by the 45-day rule, or any other reason) are clearly of no value;

    b) The redemption of credits requires certain administrative costs;

    c) The redemption of credits involves a material time delay before payment is made;

    d) Like dividends, imputation credits are taxed at the shareholder's marginal rate; and

    e) The acquisition of imputation credits comes at the cost of foregone diversification opportunities.

15. If the redemption rate is used in the regulatory setting, and if the redemption rate is greater than the value of credits, this must lead to investors being under-compensated. This is because the reduction in the allowed return, which is based on the redemption rate, exceeds the value of the imputation credits that are received by shareholders.

The use of redemption rates via the equity ownership approach and ATO tax statistics

16. Our conclusions in relation to redemption rate estimates of theta are as follows:

    a) The redemption rate is the ratio of redeemed credits to distributed credits and can be estimated in two ways:

        i) Using aggregate tax statistics published by the ATO relating to the distribution and redemption of imputation credits; and

        ii) By estimating the proportion of Australian shares that are held by resident investors, and assuming that those resident investors will redeem any imputation credit they receive;

    b) If theta is interpreted as the value of a distributed credit, redemption rates cannot be used to estimate theta. The Tribunal has ruled that redemption rates cannot be used to estimate the value of a distributed credit;

    c) ATO tax statistics are unable to produce a precise estimate of the redemption rate due to data quality issues. However, this data suggests a range of 44% to 62%;

    d) Equity ownership estimates of the redemption rates are also highly unreliable. In particular, the 70% domestic ownership estimate that appears in the Guideline should not be relied upon because it is based on data from 2007, when the foreign ownership of Australian shares was at a temporary ebb. The same ABS data source that produced the 2007 estimate now produces an estimate of 55% domestic ownership. This estimate has been confirmed in ASX estimates of the proportion of domestic ownership in 2011 and again in 2013.[5]

[4] See Section 2 of this report.

[5] The ASX reports an estimate of 54% domestic ownership.

Empirical estimates using observed prices from the market

Dividend drop-off studies

17. The AER concludes that the most relevant dividend drop-off studies are those by SFG (2011, 2013) and Vo et al (2013), and that the most relevant results from Vo et al are those that apply the standard market correction. SFG report a theta estimate of 0.35. The Vo et al estimate (using the standard market correction) is 0.34.

18. In our view, to the extent to which there is any difference between the two studies, there are two reasons to prefer the SFG studies to the Vo et al study:

    a) The SFG approach has been subjected to intense scrutiny. All data and computer code was supplied to the AER. All issues that the AER has identified have been considered by the Tribunal. And the Tribunal has endorsed and adopted the results. By contrast, the Vo et al study has not been subjected to such scrutiny;[6] and

    b) The SFG theta estimates have been shown to be stable and reliable in the face of a battery of stability and robustness checks, whereas Vo et al express concerns about the stability and reliability of its own results.

19. In any event, there is little evidence to support the Vo et al mid-point estimate of 0.45 from within its range of 0.35 to 0.55:

    a) The Vo et al estimates are overwhelmingly below 0.45 and a significant proportion of those estimates are below 0.35;

    b) The Vo et al study reports a theta estimate of 0.34 when the standard ex-day market correction is applied;

    c) The Vo et al estimate increases only to 0.4 when the standard ex-day market correction is removed; and

    d) The SFG (2013) estimates indicate that, if anything, the 0.35 estimate is towards the upper end of the reasonable range.

20. In our view, there is no reasonable basis for adopting a dividend drop-off estimate of theta above 0.35.

Other empirical evidence

21. 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.[7]

The "conceptual goalposts" test

22. The "conceptual goalposts" test posits that the allowed return on equity should be set between two theoretical extremes:

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6 Although we understand that the Vo et al (2013) study has been submitted to an academic journal for publication.

7 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.

a) The allowed return on equity in a perfect segmentation world; and

b) The allowed return on equity in a perfect integration world.

23. Implementation of the conceptual goalposts test requires estimates of all return on equity parameters as they would be under perfect segmentation and under perfect integration. The task of estimating these parameters in the real world, where observable data is available, is involved and complex. The task of estimating what these parameters *would be* if no foreign investment was allowed, and what they *would be* if markets were perfectly integrated is impossible.

24. Setting aside the estimation problems, one of the most important aspects of the conceptual goalposts test is the assumption that the risk-free rate would not change in a segmented market. That is, the government bond yield would remain the same if all foreign investors (who currently own 80% of all Australian government bonds) were banned from investing. In our view, this assumption is untenable.

25. Moreover, if the perfect segmentation risk-free rate is increased by just 1% above the perfect integration risk-free rate, the empirical estimates based on market data pass the conceptual goalposts test.

26. In our view, the conceptual goalposts test is not fit for any purpose, let alone the purpose of excluding all of the available empirical evidence.

Estimates of theta and gamma

27. As set out above, neither redemption rates nor the conceptual goalposts test can be used to estimate theta. The only appropriate way to estimate theta is via the empirical analysis of observed market prices (the same way all other WACC parameters are estimated).

28. The empirical methods produce estimates of theta in the range of 0 to 0.35. We adopt an estimate of 0.35, based primarily on the results of the SFG (2011, 2013) studies that use an accepted methodology that has been accepted by the Tribunal.

29. Relative to the 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.

30. In our view the 70% estimate of the distribution rate is uncontroversial.

31. The product of these two components produces an estimate of gamma of 0.25. In our view, this remains the best available estimate of gamma.

Market practice

32. There is clear evidence that the dominant market practice is to make no adjustment for imputation credits, but rather to consider that the firm must generate the entire return that investors require and that there is no reduction due to imputation credits.

33. If one disregards this evidence on the basis that there is a "conventional" or "classical" approach that can be used to estimate the ex-imputation required return on equity without requiring an estimate of gamma, the estimate from that other approach should at least be compared with the corresponding

estimate from the regulatory approach. Good regulatory practice would then involve the regulator explaining why its estimate of the ex-imputation required return on equity (which forms the basis of the allowed revenue) differed from the "conventional" estimate.

Conceptual definition of theta

34. On the issue of the conceptual definition of theta, we conclude that:

    a) The AER is alone in its conceptual interpretation of theta:

        i) Prior to the current Guideline, the practice of all regulators was to interpret theta[8] as the value (to the market) of distributed imputation credits;

        ii) This remains the practice of all other regulators;

        iii) The AER now proposes to refer to theta as "the utilisation rate" and to conceptualise it as "the extent to which investors can use the imputation credits they receive to reduce their personal tax"[9];

    b) None of the AER's proposed reasons for its conceptual redefinition of theta are valid, or supported by the advice that it has received:

        i) 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 Rule change is quite inconsistent with the notion that the longstanding *value* interpretation should be replaced by a different interpretation;

        ii) McKenzie and Partington (2013) identify two possible interpretations for theta – the standard value interpretation and the AER's utilisation interpretation. They express no opinion about which interpretation is correct or which should be preferred. However they do note that the "standard practice has been to measure the market value of theta"[10] and in a subsequent report they have stated that "theta is the value to the investor of the imputation credits distributed."[11];

        iii) Handley (2008) has advised the AER that his redemption rate study provides a reasonable estimate of the utilisation of imputation credits, but that the utilisation of credits cannot be used to produce an appropriate estimate of gamma. Handley advises that since theta represents the value (to the market) of imputation credits, and since redemption rates provide only an upper bound for that value, they can only be used to produce an upper bound and not a point estimate;

        iv) Officer (1994) refers to theta in terms of both value to shareholders and utilisation. However, the formulas and numerical calculations show, unambiguously, that gamma has a *value* interpretation whereby gamma represents the increase in the *value* of equity due to imputation credits, expressed as a proportion of the face value of imputation credits;

[8] Or whatever term is used for "the parameter that must be multiplied by F to obtain gamma."
[9] AER Rate of Return Guideline, Explanatory Statement, p. 159.
[10] McKenzie and Partington (2013), p. 32.
[11] McKenzie and Partington (2013), p. 31.

v) The AER cites part of a paragraph of Hathaway and Officer (2004) as supporting its proposed interpretation of theta. However, the AER has misconstrued the point that was being made, which is simply that gamma is the product of the distribution rate and theta. The remainder of the same paragraph endorses the standard value interpretation of theta: "Gamma is not the value of distributed credits alone. It is the compounding of two factors – the fraction of tax distributed as credits multiplied by the *value of distributed credits*."[12]; and

vi) Lally (2013a) advises the AER that theta can be estimated as the weighted-average utilisation rate *only under certain assumptions*, which do not hold in the AER's framework. Indeed, Lally is highly critical of the AER for continuing to estimate theta as the weighted-average utilisation rate even though it departs from the assumptions that are required for that result to hold.

[12] Hathaway and Officer (2004), p. 7.

2. The role of gamma in the regulatory process

The definition of gamma under the Rules

35. The National Gas Rules and National Electricity Rules define gamma to be the value of imputation credits:

> γ is the value of imputation credits.[13]

Gamma determines the allowed return to shareholders

36. Under the Australian regulatory framework, the gamma parameter plays the role of determining:

    a) What proportion of the total return to equity must come from allowed revenues; and

    b) What proportion of the total return to equity is assumed to come from dividend imputation tax credits.

37. In particular, the proportion of the total return that is assumed to come from allowed revenues is:

$$\frac{1-T}{1-T(1-\gamma)}$$

where T is the corporate tax rate, the balance being assumed to come from the value of imputation credits.

38. By way of example, the Guideline proposes that γ = 0.50, which (together with a corporate tax rate of 30%) implies that 82%[14] of the total return to equity comes from allowed revenues and 18% is assumed to come from imputation credits. For example, suppose that the total required return on equity is 10%. The parameter estimates set out in the Guideline imply that the allowed revenue should be set so that the firm is able to provide a return of 8.2% to its shareholders, the other 1.8% being assumed to come from the value of imputation credits.

39. That is, every dollar of value that is ascribed to imputation credits reduces the regulatory allowed return to equity by a dollar. For example, consider a regulated firm with $100 of equity capital in its regulatory asset base (RAB) and an allowed return on equity of 10%. This implies that equity holders require a return of $10. If the regulator determines that the imputation credits received by shareholders are valued at $1.80 (consistent with the parameter values proposed in the Guideline), the regulator will allow the firm to charge prices that enable it to pay a return of $8.20 to shareholders.

40. In this case, shareholders lose $1.80 of value from the return provided by the firm, but are assumed to gain $1.80 of value from the imputation credits that they receive. That is, shareholders are assumed to be indifferent between:

    a) Receiving a return of $10 from the firm; or

    b) Receiving $8.20 from the firm and imputation credits that they value at $1.80.

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[13] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).

[14] $\frac{1-T}{1-T(1-\gamma)} = \frac{1-0.3}{1-0.3(1-0.5)} = 0.82$.

41. In summary, the role of gamma in the regulatory process is to determine the *value* of imputation credits, such that this value can be deducted from the return that the regulated firm is able to pay to its shareholders.

42. By way of analogy, a casual fruit shop employee may be indifferent between receiving a $100 wage or a $90 wage and fruit that is worth $10 to them. They are unlikely to be indifferent between a $90 wage and 10 *grams* of fruit, or 10 *pieces* of fruit, or even a fruit basket that has a marked price of $10 but which is not worth $10 to *them*. If their pay is being reduced by $10, they will need as compensation something that has equivalent monetary *value* to them.

43. The same applies in the regulatory setting. The estimate of gamma determines the amount of reduction in the monetary return that is paid to shareholders. It should be set to equate the monetary *value* of imputation credits with the monetary reduction in the allowed return that is paid to shareholders. Thus, the regulatory task is to determine the monetary value of imputation credits and to then reduce the allowed return on equity by that same monetary value.[15]

44. In our view, the relevant task in the regulatory setting is to:

a) Determine the required return on equity having regard to all relevant evidence and the prevailing conditions in the market for equity funds; and to then

b) Determine how much of that required return can be obtained from imputation credits, having regard to all relevant evidence and the prevailing conditions in the market for equity funds; and to then

c) Set allowed prices so that the firm will be able to pay to its shareholders a return that is equal to the difference between (a) and (b) above.

45. In other words, gamma determines the *price* that shareholders would be prepared to pay to buy imputation credits. In the example above, shareholders are assumed to be willing to pay $1.80 (by receiving a return that is $1.80 lower than it would otherwise be) for the imputation credits that they receive. The regulator needs to determine the dollar value that shareholders would ascribe to imputation credits, and then reduce the return that they receive from the regulated firm by that amount. If the regulator reduces the allowed return by more than the true value of the credits, shareholders will end up being under-compensated. Conversely, if the regulator reduces the allowed return by less than the true value of the credits, shareholders will end up being over-compensated. Neither of these outcomes is appropriate.

46. In our view, it is clear that gamma represents the value (or worth or price) that shareholders ascribe to imputation credits. The only question then is how to best estimate that value.

General framework

47. The standard approach is to estimate gamma as the product of two parameters:

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

[15] The ENA (2013) submission contains a detailed explanation of this issue, including a fully-worked numerical example. See ENA (2013), *Response to the Draft Rate of Return Guideline of the Australian Energy Regulator*, 11 October, pp. 137-140.

where F represents the distribution rate and θ (**theta**) represents the value of a distributed imputation credit.[16]

48. Australian companies generate imputation credits via the payment of Australian corporate tax. Every dollar of corporate tax payment creates a dollar of imputation credits. These credits can then be distributed to shareholders by attaching them to dividends in the ratio of $\frac{T}{1-T}$ credits for every dollar of dividends, where T is the corporate tax rate. At the current 30% tax rate, 43 cents of credits can be attached to every dollar of dividends.[17]

49. To distribute all of the credits that are created in a given year, the firm would have to pay out 100% of its Australian profits as a dividend. For example, a company that earned a pre-tax profit of $100 would pay $30 of corporate tax, thus creating $30 of imputation credits. If it then paid out the entire post-tax profit of $70 as a dividend, it could attach $\frac{0.3}{1-0.3}\times 70 = \$30$ of credits.

50. Of course, companies do not generally distribute 100% of their post-tax profits as dividends – they retain some profits for purposes such as financing future capital expenditure. In this case, some of the credits that are created will not be distributed. The distribution rate (F) represents the proportion of created credits that are distributed. We show in Section 3 of this report that there is widespread agreement that an appropriate estimate of this parameter is 70% – on average 70% of the credits that are created are attached to dividends and distributed to shareholders and 30% are not distributed.

51. The second parameter, theta, represents the value that shareholders place on those credits that *are* distributed. We expand upon the definition of the "value" of distributed imputation credits in the remainder of this section below. At this point, we simply note by way of example that if 70% of created credits are distributed, and if those distributed credits are valued at, say, 35% of their face value, the appropriate estimate of gamma would be:

$$\gamma = F \times \theta = 0.7 \times 0.35 = 0.25.$$

52. Defining gamma to be the product of two sub-parameters in this way is generally accepted. This approach was adopted by the AER in its 2009 WACC Review, it is consistent with the approach currently used by other regulators.

The role and definition of theta

Theta determines the extent to which imputation credits are reflected in stock prices

53. In a dividend imputation tax system, investors receive three potential benefits from owning shares:

a) Dividends;

b) Capital gains; and

c) Imputation credits.

[16] This standard approach is also adopted in the Guideline. See AER Guideline, p. 23. The Guideline refers to F as the "payout ratio" and to theta as the "utilisation rate."

[17] $\frac{0.3}{1-0.3} = 0.43.$

54. For example, an investor who bought a share today could sell it after one year at the market price at that time, and would also receive the benefits of any dividends and imputation credits that were paid during the course of the year. In this setting, the current stock price can be written as the present value of:

a) The expected stock price at the end of the year;

b) Any dividends paid during the year; and

c) The value of imputation credits distributed during the year.

55. For example, in his recent report for the AER, Lally (2013)[18] notes that the current stock price can be written as the present value (over the next year) of dividends, imputation credits and the end-of-year stock price:[19]

$$S_0 = \frac{Div_1 + \theta \times IC_1 + S_1}{1 + r_e}$$

where IC_1 represents the (per share) imputation credits that are distributed to shareholders.

56. This expression makes it clear that θ represents the extent to which the value of distributed imputation credits is reflected in the current stock price. That is, theta represents the extent to which the *value* of the stock price is higher as a result of the imputation credits that are to be distributed: Theta is the extent to which distributed imputation credits are capitalised into the stock price. For example, if the firm distributed a $1 imputation credit, and if the pending receipt of this credit caused the stock price to be 35 cents higher than it would otherwise have been, theta is 0.35.

57. Moreover, we show in Appendix 3 to this report that the proportion of the firm's equity market capitalisation that is due to imputation credits is:[20]

$$\frac{\theta T}{1 - T(1-\theta)}.$$

58. For example, the parameter values proposed in the Guideline suggest that approximately one quarter of the value of the entire Australian market (more than $300 billion of the $1.5 trillion total market capitalisation) is attributable to imputation credits:

$$\frac{\theta T}{1 - T(1-\theta)} = \frac{0.7 \times 0.3}{1 - 0.3(1 - 0.7)} = 23\%,$$

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[18] Lally, M., 2013, *The Estimation of Gamma*, Report for the AER, 23 November.

[19] See Lally (2013a), Equation 3, p. 10. Note that we use θ rather than U and r_e rather than $R_f + \phi\beta_e$. We also define the post-tax cash flow to shareholders to be "dividends" so that $Div_1 = Y_1 - TAX_1$.

[20] To see this, note that for every dollar of dividends (which are assumed to be fully reflected in the stock price under the assumption that cash dividends are valued at 100% of face value), there will be $\frac{T}{1-T}$ dollars of imputation credits, which are valued at $\$\theta$ each. Thus, for every dollar of dividends, there are imputation credits that have a value of $\frac{\theta T}{1-T}$. Consequently, the imputation credits account for a relative proportion of $\frac{\theta T/1-T}{1+\theta T/1-T} = \frac{\theta T}{1-T(1-\theta)}$. A more formal derivation of this expression is set out in Appendix 3 to this report.

which is too high to be considered plausible.

Regulatory practice

59. The practice that has always been adopted by Australian regulators is consistent with theta representing the value of distributed imputation credits – the extent to which they are capitalised into the stock price.

60. For example, in its 2009 WACC Review, the AER stated that:

> θ (theta) is the per dollar value of a distributed credit.[21]

61. In its current Guideline materials the AER notes that it has previously:

> adopted the market value definition of the utilisation rate[22]

and evaluated all evidence:

> relative to the market value approach.[23]

62. Interpreting theta as the market value of a distributed credit is also the approach that is currently adopted by all other regulators. For example, in its recent Guideline under the NER and NGR, the ERA defines theta to be:

> …the market value of imputation credits distributed as a proportion of their face value (θ).[24]

noting that:

> This approach is widely accepted by Australian regulators.[25]

63. In addition, in its recent WACC Review IPART stated that:

> imputation credits have *value* to equity owners and this *value* is reflected in our revenue determination process.[26]

64. IPART also stated that the proportion of the total return that is assumed to come from allowed revenues is:

$$\frac{1-T}{1-T(1-\gamma)}$$

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[21] AER 2009 WACC Review Final Determination, p. 414.
[22] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 139.
[23] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 139.
[24] ERA Rate of Return Guideline, Explanatory Statement, Paragraph 922.
[25] ERA Rate of Return Guideline, Explanatory Statement, Paragraph 922.
[26] IPART 2013 WACC Review, p. 17, emphasis added.

with the balance being assumed to come from the value of imputation credits.[27]

The difference between the redemption rate and the value of distributed credits

65. There are a number of reasons why the value of distributed imputation credits that is reflected in share prices may be less than the face value of those credits, including:

    a) Some of the credits that are distributed to shareholders are never redeemed. There are, in turn, a number of reasons why a distributed credit might not be redeemed, including:

        i) Credits distributed to non-resident investors cannot be redeemed under the dividend imputation legislation;

        ii) Credits distributed to resident investors who sell the shares within 45 days of their purchase cannot be redeemed;[28] and

        iii) Some credits distributed to resident investors are not redeemed because some investors fail to keep the required records and simply do not claim them. For example, Handley and Maheswaran (2008) report that, on average 8% of the credits distributed to resident individuals are never redeemed.[29]

    b) There is a time delay in obtaining any benefit from imputation credits. Whereas dividends are available to the investor as soon as they are paid, the imputation credits that are attached to that dividend only have value after the investor's end-of-year tax return is filed and processed. This time delay can be up to two years for a credit that is distributed directly from a company to an individual shareholder. The time delay can be even greater when credits are distributed through other companies or trusts;

    c) There are administrative costs involved in the redemption of imputation credits. The investor must maintain records of all credits that are received and redeem them by preparing the necessary schedules for the investor's tax return. This involves time and expenses such as accountant fees. By contrast, when an investor buys shares, they provide bank account details and all dividends are automatically transferred into that account without any action required of the investor. That is, it is more costly to convert imputation credits into value;

    d) Imputation credits are taxed as income in the same way that dividends are taxed. When an investor receives a franked dividend, their taxable income is increased by the amount of the dividend plus the face value of the credit. Both components are then taxed at the investor's marginal tax rate; and

    e) If dividend imputation leads resident investors to hold more domestic dividend-paying shares than they otherwise would (because they are attracted by the possibility of receiving imputation credits) their portfolios will become more concentrated and the resulting loss of diversification comes at a cost. A rational investor would continue to increase the concentration of their portfolio until the marginal benefit of the last imputation credit

[27] IPART 2013 WACC Review, p. 17.

[28] The so-called "45 day Rule" took effect in July 1997. It prevents resident investors from redeeming imputation credits unless they own the shares for 45 days around the payment of the relevant dividend.

[29] This figure includes credits that are not redeemed due to the 45-day Rule and, for the pre-2000 period, credits that are not redeemed because the shareholder has taxable income below the tax-free threshold. The latter is likely to be immaterial as it is unlikely that a material proportion of shares are owned by residents whose income is below the tax-free threshold.

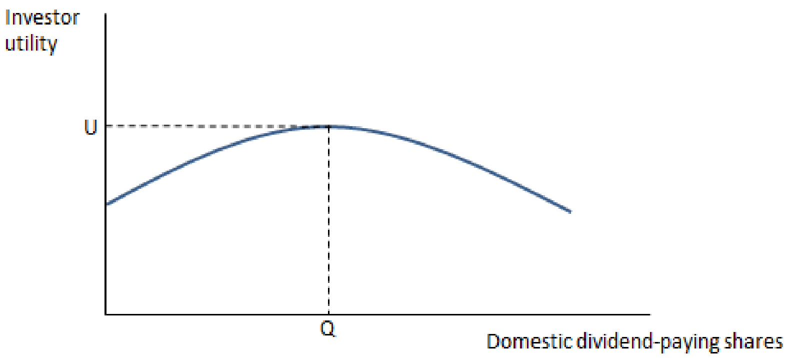
equalled the marginal cost of losing diversification. That is, the last imputation credit would be of no net benefit.[30]

66. This last point about portfolio diversification is particularly important and has been recognised by Lally (2013) and other regulators:

> The ERA (2013, page 5) goes even further and asserts that even domestic investors would value franking credits less than their face value because they must incur risk, pay transaction costs, and sacrifice international diversification opportunities by purchasing Australian stocks with imputation credits.[31]

67. To explore the portfolio diversification point in more detail, first consider Figure 1 below in a market with no dividend imputation. That figure shows the utility[32] of a particular investor as a function of the proportion of their wealth that is invested in domestic dividend-paying shares (as opposed to domestic shares that do not pay dividends, international shares, or other assets such as real property, term deposits, bank balances and so on). Figure 1 shows that the optimal investment in domestic dividend-paying shares is at Q, because this maximises the investor's utility at U.

Figure 1
Optimal portfolio holding of domestic dividend-paying shares



68. If the investor moved away from their optimal investment in domestic dividend-paying shares (Point Q), the result would be a loss of utility, in which case the investor would be worse off. This is illustrated in Figure 2 below, which shows that an over-investment in domestic dividend-paying shares (at Q*) leads to a reduction in utility (U*).

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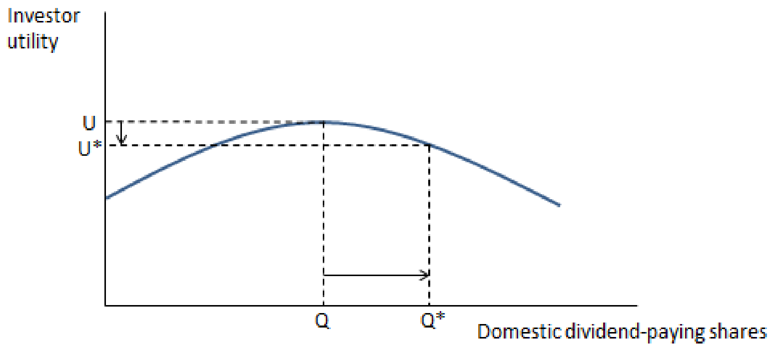
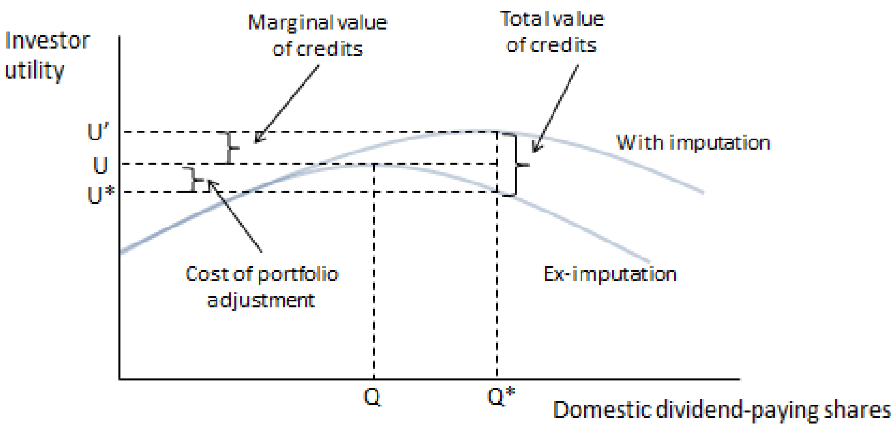
[30] This effect is explained in more detail in Paul Lajbcygier and Simon Wheatley (2012), "Imputation credits and equity returns," *The Economic Record*, 88, 283, 476-494.
[31] Lally (2013), p. 16. The reference to ERA (2013) appears to be a reference to Vo, Gellard and Mero (2013).
[32] Utility is the economic concept of well-being or satisfaction. The basis of most economic models is the notion that individuals will act to maximise their utility.

Figure 2
Sub-optimal portfolio holding of domestic dividend-paying shares



69. Now suppose that imputation is introduced into this market, as illustrated in Figure 3 below. The domestic investor is likely to alter their portfolio by increasing their investment in domestic dividend-paying shares. This causes the investor to move away from their optimal portfolio, which comes at a cost – reducing utility from U to U*. However, that cost is more than compensated by the value that the investor receives from imputation credits. When the value of imputation credits is included, the curve shifts and the optimal investment in domestic dividend-paying shares is at Q*, producing utility of U'. This optimum occurs at the point where the marginal benefit of the next imputation credit is exactly offset by the marginal cost of further concentration of the investor's portfolio. That is, the last dollar of imputation credits that the investor receives has a negligible marginal benefit.

Figure 3
Australian government bond yields and the proportion of domestic ownership



70. Figure 3 also shows clearly that the net benefit that this investor receives from imputation credits is to increase utility from U to U'. This net benefit is obtained by subtracting the cost of portfolio adjustment from the total value of the credits. In summary, the value that the investor obtains from imputation credits comes at a cost – the cost of concentrating the investor's portfolio into domestic dividend-paying shares.

Regulatory implementation

71. It is generally accepted that there is a difference between the redemption rate (the proportion of distributed credits that are redeemed by investors) and the value of those credits to investors. "Value" is likely to be less than "redemption" for a number of reasons, including those set out above. In other words, redemption might be considered to be an upper bound for value.

72. Suppose, for the purposes of this example, that the weighted-average redemption rate of distributed credits is 70% and the value of distributed credits is 35%. That is, of every dollar of distributed credits 70 cents is redeemed, and every dollar of distributed credits is valued by the market at 35 cents.

73. Now suppose a regulator reduces the allowed return to equity by 70 cents for every dollar of imputation credits that the benchmark firm would be able to distribute. This means that shareholders receive a reduction in their allowed return of 70 cents in relation to an imputation credit that is worth only 35 cents to them. Consequently, the shareholders are under-compensated – the total value of the allowed return and the imputation credits that they receive is less than the required return. This has obvious consequences for the incentive to engage in an efficient level of investment.

Empirical estimation techniques

74. Empirical estimation techniques have been developed for the purposes of estimating the weighted-average redemption rate and for the purpose of estimating the market value of distributed credits.

75. The weighted-average redemption rate can be estimated by:

    a) Estimating the proportion of credits that are distributed to resident investors and by assuming that all of those investors will redeem all of the credits that are distributed to them (the "equity ownership method"); and

    b) Using ATO tax statistic data to estimate the ratio of total credits redeemed to total credits distributed.

76. The market value of distributed credits can be estimated by:

    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 trade analysis, which estimates the market value of dividends and imputation credits as the difference between (a) the market value of a security that includes entitlement to the dividend and credit, and (b) the market value of a security that does not include entitlement to the dividend and credit.

Summary

77. The estimate of gamma determines the amount of reduction in the monetary return that is paid to shareholders. It should be set to equate the monetary *value* of imputation credits with the monetary reduction in the allowed return that is paid to shareholders. Thus, the regulatory task is to determine the monetary value of imputation credits and to then reduce the allowed return on equity by that same monetary value. Consistent with this interpretation, the Rules state that "γ is the value of imputation credits."[33]

78. Australian regulatory practice (including the practice of the AER) has always been to interpret gamma as the value (as in *market value* or *worth*) of imputation credits. All regulators other than the AER still adopt that interpretation.

[33] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).

79. The standard approach is to estimate gamma as the product of two parameters:

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

where F represents the distribution rate and θ (**theta**) represents the value of a distributed imputation credit.[34]

80. Consistent with the value interpretation of gamma, theta represents the value of distributed imputation credits – the extent to which a distributed credit is capitalised into the stock price.

81. Investors are likely to value imputation credits at less than their face value for a number of reasons:

    a) Credits that are not redeemed (because they are distributed to non-residents, or they are excluded by the 45-day rule, or any other reason) are clearly of no value;

    b) The redemption of credits requires certain administrative costs and involves a material time delay before payment is made;

    c) Like dividends, imputation credits are taxed at the shareholder's marginal rate; and

    d) The acquisition of imputation credits comes at the cost of foregone diversification opportunities.

82. If the redemption rate is used in the regulatory setting, and if the redemption rate is greater than the value of credits, this must lead to investors being under-compensated. This is because the reduction in the allowed return, which is based on the redemption rate, exceeds the value of the imputation credits that are received by shareholders.

83. The weighted-average redemption rate can be estimated by the equity ownership method or by using aggregate tax statistics. The market value of distributed credits can be estimated by dividend drop-off analysis or by simultaneous trade analysis.

[34] This standard approach is also adopted in the Guideline. See AER Guideline, p. 23. The Guideline refers to *F* as the "payout ratio" and to theta as the "utilisation rate."

3. An assessment of the AER's approach for estimating the distribution rate

Definition

84. The distribution rate (*F*) is the ratio of (a) the total amount of franking credits distributed to shareholders in a given year, to (b) the total amount of franking credits created in a given year. The average distribution rate over a period can be estimated as the ratio of the total credits distributed during the period to the total credits created during that period. The Australian Tax Office (**ATO**) maintains statistics on both components of this ratio.

Current estimates

85. There is almost universal endorsement of 0.7 as an appropriate estimate of the distribution rate.[35]

Australian Competition Tribunal estimate is 0.7

86. 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.[36]

AER estimate is 0.7

87. The AER has reaffirmed its use of a distribution rate of 0.7 in its final 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.[37]

88. 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.[38]

The ERA estimate is 0.7

89. 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.[39]

McKenzie and Partington estimate is 0.7

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

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[35] The only current estimate that differs from 0.7 is the Lally (2013) back-of-the-envelope estimate based on a sample of only 10 firms. That estimate, and the reasons for assigning no weight to it, are set out in Appendix 4 to this report.
[36] Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompT 9 (24 December 2010), Paragraph 4.
[37] AER Rate of Return Guideline, p. 23.
[38] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[39] ERA, Rate of Return Guideline, p. 9.

> 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.[40]

Conclusions and recommendations

91. Our main conclusions in relation to the distribution rate are:

    a) The accepted empirical approach consistently produces an estimate of 0.7;

    b) The standard Australian regulatory practice is to adopt a distribution rate of 0.7;

    c) All stakeholders have proposed a distribution rate of 0.7;

92. For the reasons set out above, we concur with the distribution rate of 0.7 that is adopted in the Guideline.

[40] McKenzie and Partington, p. 31.

4. An assessment of the AER's approach for estimating theta

The interpretation of theta in the Guideline

93. The Guideline refers to theta as the "utilisation rate" which is defined to be:

> 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).[41]

94. Thus, the utilisation rate[42] is defined to be the weighted-average of the extent to which investors are able to use imputation credits to reduce their tax or obtain a refund.

95. That is, the Guideline defines theta to be the aggregate proportion of distributed imputation credits that investors are able to redeem. This proportion is known as the *redemption rate* or *redemption ratio*. The Guideline materials note that this differs from the AER's previous approach, which was to define theta to be the value (as in *market value* or *worth*) of distributed credits.

96. The Guideline materials are not suggesting that the redemption rate can be used to estimate the value of imputation credits. Rather, the Guideline materials propose that the appropriate task is not to estimate the value of distributed credits at all, but that the appropriate task is to estimate the proportion of distributed credits that investors are able to redeem.

97. Appendix 5 and Appendix 6 to this report review the "re-evaluation of the conceptual task"[43] that led to the redefinition of theta in the Guideline. The general conclusions from these appendices is that none of the proposed reasons for the conceptual redefinition of theta that are set out in the Guideline materials are valid, or supported by advice or evidence.

Value vs. redemption

98. Section 2 of this report demonstrates why theta must be interpreted as the value of distributed imputation credits – the extent to which distributed credits are reflected in the stock price. By contrast, the Guideline materials propose that the appropriate task is not to estimate the value of distributed credits at all, but that the appropriate task is to estimate the proportion of distributed credits that investors are able to redeem – the redemption rate.

99. Section 2 of this report also sets out a number of reasons why the value of distributed credits (capitalised into the stock price) is likely to be materially lower than the redemption rate (the proportion of distributed credits that are redeemed).

100. In our view, theta represents the value of distributed imputation credits. Consequently, we require empirical methods for estimating that value – for estimating the extent to which distributed credits are reflected in the stock price.

Estimation approaches in the Guideline

101. The Guideline sets out four estimation approaches:[44]

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[41] AER Rate of Return Guideline, Explanatory Statement, p. 159, Footnote 530.
[42] Or "theta" or "the parameter that must be multiplied by F to obtain gamma."
[43] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[44] AER Rate of Return Guideline, Explanatory Statement, p. 159.

a) The equity ownership approach;

b) Tax statistics studies;

c) Implied market value studies; and

d) The "conceptual goalposts" approach.

102. The first two of these approaches are designed to provide estimates of the redemption rate. The equity ownership approach estimates the proportion of Australian shares that are owned by resident investors, and then assumes that all imputation credits distributed to those resident investors will be redeemed. The tax statistic studies use ATO data to estimate the ratio of (a) the quantity of imputation credits redeemed in a given year, to (b) the quantity of imputation credits distributed in that year. Both of these methods are designed to estimate the redemption rate. The Guideline materials conclude that the evidence from these two approaches supports a redemption rate of 70% – that 70% of the credits that are distributed end up being redeemed by resident investors.[45]

103. Implied market value studies are designed to estimate the value of distributed imputation credits – the extent to which the value of distributed credits is capitalised into stock prices. These approaches all use stock price data – to determine the extent to which the value of imputation credits is reflected in the stock price. The AER concludes that this evidence supports a value of distributed credits of 0-50% of their face value.[46]

104. The conceptual goalposts approach is based on the Lally (2013) report commissioned by the AER. This approach constrains the estimate of theta by requiring it to produce an allowed return on equity that lies between (a) an estimate of the return on equity that investors would require if Australia was perfectly segmented from world capital markets, and (b) an estimate of the return on equity that investors would require if world capital markets were perfectly integrated. The Guideline materials conclude that estimates "in the range 0.8 to 1.0 meet this test."[47]

105. The AER has "less regard"[48] to the market value studies and conceptual goalposts approaches because these approaches do not produce estimates of the redemption rate, which the Guideline defines to be the correct interpretation of theta. The Guideline materials simply note that:

> 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 [of 0.7 from the two approaches for estimating the redemption rate] is reasonable.[49]

106. In relation to the use of these four approaches, we conclude that:

a) If theta is defined in the standard way as representing the value of distributed imputation credits, the only relevant evidence comes from the implied market value studies; and

[45] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[46] AER Rate of Return Guideline, Explanatory Statement, p. 168.
[47] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[48] AER Rate of Return Guideline, Explanatory Statement, p. 160.
[49] AER Rate of Return Guideline, Explanatory Statement, p. 160.

b) If theta is re-defined to represent the redemption rate, the only relevant evidence comes from the equity ownership approach and tax statistics studies – both of which provide estimates of the redemption rates.

107. In our view, there is no valid basis for mixing point estimates of entirely different things.

Issues with the estimation approaches in the Guideline

Overview

108. As set out above, we adopt the standard definition that theta represents the value of distributed imputation credits. Consequently, our view is that the implied market value studies provide the only relevant evidence – the other approaches do not purport to estimate the value of distributed credits, so they are not relevant in our view. We review and summarise the relevant market value studies in the subsequent section of this report.

109. The remainder of this sub-section of the report summarises a range of issues relating to the implementation of the other three approaches that are set out in the Guideline. That is, our view is that:

a) The equity ownership, tax statistic and conceptual goalposts approaches should not be considered because they are irrelevant – they purport to estimate something other than the value of distributed credits, so they cannot be used to estimate theta; and

b) Even if those approaches were to be considered, their implementation is so fraught with difficulty that the resulting estimates are likely to be unreliable.

The equity ownership approach

110. The equity ownership approach seeks to estimate the redemption rate by first estimating the proportion of Australian shares that are owned by resident investors, and then by assuming that all imputation credits distributed to those resident investors will be redeemed. Thus, the key requirement is an estimate of the proportion of Australian shares that are owned by resident investors. The Guideline adopts a final estimate of 70% based on data from a 2007 report produced by the Australian Bureau of Statistics (ABS).

111. The key problem with this estimate is that it is so dated that it is no longer relevant. In particular, that estimate is based on data from 2007, when the foreign ownership of Australian shares was at a temporary ebb. In recent years, the proportion of domestic ownership has been around 55%, not 70%. The same ABS data source that produced the 2007 estimate now produces an estimate of 55% domestic ownership. This estimate has been confirmed in ASX estimates of the proportion of domestic ownership in 2011 and 2013.[50]

112. These issues are addressed in more detail in Appendix 8 to this report.

Tax statistics studies

113. The equity ownership approach seeks to estimate the redemption rate by using ATO data to estimate the ratio of (a) the quantity of imputation credits redeemed in a given year, to (b) the quantity of imputation credits distributed in that year. There are a number of problems with estimates using this approach:

[50] The ASX reports an estimate of 54% domestic ownership.

a) Implementation of this approach requires the use of two separate ATO databases that are inconsistent in the amount of $87.5 billion;

b) Hathaway (2013) has used the tax statistic method in previous papers but now concludes that:

> I would caution anyone…against relying on those parts of my earlier reports which focused on ATO statistics;[51]

c) Lally (2013) notes the concerns that have been expressed in relation to the reliability of the tax statistics data and concludes that:

> the best that can be said of all this is that the redemption rate is uncertain;[52]

d) The ATO data does not discriminate between public and private companies. Many micro businesses are structured as private companies that routinely distribute all imputation credits to their owners who redeem them all. Thus, the redemption rate for these businesses will be higher than for the average exchange-listed business. In this regard, we note that all other WACC parameters are estimated with reference to exchange-listed businesses (and not private micro and small businesses) because exchange-listed businesses are more reflective of the efficient benchmark entity.

114. These issues are addressed in more detail in Appendix 8 to this report.

Conceptual goalposts approach

115. The conceptual goalposts approach constrains the estimate of theta by requiring it to produce an allowed return on equity that lies between (a) an estimate of the return on equity that investors would require if Australia was perfectly segmented from world capital markets, and (b) an estimate of the return on equity that investors would require if world capital markets were perfectly integrated. The main problems with the implementation of this approach are:

a) It requires estimates of what each WACC parameter would be in each of those theoretical scenarios, which is an impossible task.[53] For example, it is difficult to obtain precise estimates of beta and MRP as they are in the real world, where relevant data is available. The conceptual goalposts approach further requires estimates of what beta and MRP *would be* if no foreign investment was allowed, and what they *would be* if markets were perfectly integrated;

b) Even if it was possible to derive point estimates of beta and MRP as they would be in these theoretical scenarios, the reasonable ranges (or confidence intervals) around the point estimates would be so wide as to render the resulting estimates of no use whatsoever;

c) All of the Lally (2013) calculations are based on a mechanistic implementation of the Sharpe-Lintner CAPM where MRP is estimated solely from the historical arithmetic mean of excess stock returns, which is inconsistent with the Guideline's approach of having regard to other relevant evidence;

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[51] Hathaway (2013), Paragraph 12.
[52] Lally (2013), p. 15.
[53] See Lally (2013a), Section 3.9.

d) The key assumption of the conceptual goalposts approach is that the risk-free rate would be the same in a perfect segmentation world as in a perfect integration world. In our view, the notion that the government bond yield would be unchanged if all foreign investment were withdrawn is implausible. If the perfect segmentation risk-free rate is increased by just 1% above the perfect integration risk-free rate, all of the empirical estimates based on market data satisfy the conceptual goalposts test. That is, even setting aside all of the other problems with such a test, none of the market-based empirical estimates are ruled out unless one assumes that government bond yields would be identical whether or not foreign investors are admitted.

116. Moreover, the Guideline's 0.7 estimate of theta fails the conceptual goalposts test. According to Lally (2013), every estimate of theta fails the test other than his own theoretically reasoned estimate of 1. The Guideline materials cite Lally (2013, pp. 46-47) as supporting the conclusion that estimates "in the range 0.8 to 1.0 meet this test."[54] However, Lally (2013) makes no such conclusion. He never even considers an estimate of 0.8. Rather, his conclusion is that estimates "that are significantly less than 1 fail this test in virtually every case examined, and are therefore deficient"[55] and that "the only sensible estimate…is at or close to 1."[56]

117. The Guideline materials conclude that the conceptual goalposts test supports the proposed estimate of theta (0.7) on the basis that this estimate fails the test less severely than some standard empirical estimates. In our view, there are three difficulties with this conclusion:

a) The fact that the Guideline estimate fails the test would generally mean that the test does *not* support the Guideline estimate; and

b) Using the conceptual goalposts test to rule out the standard empirical estimates requires one to believe that:

i) It is not possible to reliably estimate the extent to which investors value imputation credits in the real world; but

ii) It is possible to reliably estimate (to three decimal places) the total return on equity that investors would require from the benchmark firm in a world where Australia was perfectly segmented from global capital markets, and in a world where Australia was perfectly integrated into global capital markets; and

c) The test requires that the government bond yield would remain unchanged whether or not foreign investors (who currently own 80% of those bonds) are excluded from the market.

118. These issues are addressed in more detail in Appendix 8 to this report.

Summary and conclusions

119. Our view is that:

a) The equity ownership, tax statistic and conceptual goalposts approaches should not be considered because they are irrelevant – they purport to estimate something other than the value of distributed credits, so they cannot be used to estimate theta; and

[54] AER Rate of Return Guideline, Explanatory Statement, Footnote 533, p. 160.
[55] Lally (2013), pp. 46-47.
[56] Lally (2013), pp. 46-47.

b) Even if those approaches were to be considered, their implementation is so fraught with difficulty that the resulting estimates are likely to be unreliable.

120. In our view, theta represents the value of distributed credits and consequently it is only empirical estimates of the value of distributed credits that are relevant. We consider this evidence in the subsequent section.

5. Empirical estimates of the value of distributed imputation credits

Dividend drop-off analysis

121. Dividend drop-off analysis is the approach that is most commonly used to estimate the value of distributed imputation credits – specifically, the extent to which the value of distributed credits is reflected in the stock price. This approach involves a comparison of the price of a stock immediately before an ex-dividend date (which reflects the value of the dividend and the associated imputation credit) with the price immediately after the ex-dividend date (which no longer reflects the value of the dividend and the associated imputation credit). The difference in value reflects the implied value of the dividend and the associated imputation credit – in particular, the extent to which they were capitalised into the stock price.

122. As set out in Section 2 above, Lally (2013) shows that the current stock price can be written as the present value (over the next year) of dividends, imputation credits and the end-of-year stock price:[57]

$$S_0 = \frac{Div_1 + \theta \times IC_1 + S_1}{1 + r_e}$$

where IC_1 represents the (per share) imputation credits that are distributed to shareholders.

123. The rationale for dividend drop-off analysis can be explained with reference to the above equation. In particular, a simple rearrangement of that equation yields:

$$\frac{S_0(1 + r_e) - S_1}{Div_1} = 1 + \theta \frac{IC_1}{Div_1}$$

where the left hand side of that equation is the dividend drop-off ratio, which is regressed on the ratio of credits to dividends to obtain an estimate of theta – the extent to which imputation credits have been capitalised into the stock price.[58]

Current dividend drop-off estimates

124. The studies that provide recent dividend drop-off estimates of the value of distributed imputation credits are as follows:

   a) The SFG (2011) study that was accepted by the Tribunal in the *Gamma* case;[59]

   b) An updated study performed by SFG (2013) and recently submitted to the AER;[60] and

   c) A drop-off analysis performed by ERA staff, Vo et al (2013).[61]

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57 See Lally (2013a), Equation 3, p. 10. Note that we use θ rather than U and r_e rather than $R_f + \phi\beta_e$. We also define the post-tax cash flow to shareholders to be "dividends" so that $Div_1 = Y_1 - TAX_1$.

58 There are a range of methodological specifications for dividend drop-off analysis. The purpose here is not to derive all of them in detail, but simply to demonstrate how the basic structure of drop-off analysis falls out of the framework of Lally (2013a).

59 Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 29.

60 SFG (2013), Updated dividend drop-off estimate of theta, 7 June 2013.

61 Vo et al (2013).

125. In relation to dividend drop-off analysis, the Guideline materials conclude that "the most relevant dividend drop off studies" are those "by SFG and Vo et al."[62]

126. The SFG study that was accepted by the Tribunal and the updated version of that study both recommend a point estimate of 0.35 from within a range of point estimates around 0.35.

127. The ERA study performed by Vo et al (2013) concludes that:

> The appropriate range suggested by this study is between 0.35 and 0.55.[63]

Guideline conclusions

128. The Guideline materials conclude that the dividend drop-off evidence supports a range of 0.35 to 0.55. In our view, the Guideline is inconsistent in forming its range from the aggregation of:

    a) A *range* from the Vo et al study, and

    b) A *point estimate* (from within the reasonable range) from the SFG studies.

129. The SFG studies report a range of estimates with a confidence interval around each estimate. The final point estimate of 0.35 was selected from within a reasonable range. If the results of the two studies are to be combined, consistency would require either that the final point estimates from each study should be combined, or that the reasonable ranges from each study should be combined. Clearly, any combined reasonable range would extend below 0.35.

130. In our view, the SFG studies should be preferred to the Vo et al study for a number of reasons that are set out below.

The merits of the SFG studies

131. The SFG studies arose out of a direction from the Australian Competition Tribunal in what has become known as the *Gamma* Case. In that case, the AER had sought to rely on a dividend drop-off study by Beggs and Skeels (2006)[64]. The Tribunal held[65] that the AER was wrong to rely on an out-dated and methodologically unsound dividend drop-off study. The Tribunal then directed that a "state-of-the-art" dividend drop-off study should be conducted to assist the Tribunal.[66] The Tribunal also directed that the dividend drop-off study to be performed by SFG "should employ the approach that is agreed upon by SFG and the AER as best in the circumstances."[67]

132. After agreement could not be reached between the parties, the Tribunal ruled that:

    a) The four variations of the econometric specification of dividend drop-off analysis drawn by SFG from the literature should be used; and

    b) The results for the full updated period should be used rather than a number of sub-periods.

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[62] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 174.
[63] Vo et al (2013), Abstract.
[64] Beggs, D. J. and Skeels, C.L., (2006), "Market arbitrage of cash dividends and franking credits," *Economic Record*, 82 (258), 239 – 252.
[65] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraphs 66, 145.
[66] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 146.
[67] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 147.

133. SFG then conducted the dividend drop-off study and circulated a draft report to all parties. The AER and the regulated businesses that were parties to the *Gamma Case*[68] provided detailed comments on the draft report and these were taken into account in a revised report that was provided to all parties and to the Tribunal.

134. The Tribunal 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.[69]
>
> 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.[70]

135. 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.[71]

and

> The Tribunal finds itself in a position where it has one estimate of theta before it (the SFG's March 2011 report value of 0.35) in which it has confidence, given the dividend drop-off methodology. No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value.[72]

136. The SFG study concluded that:

> For the reasons set out in detail in this report, we conclude that the appropriate estimate of theta from the dividend drop-off analysis that we have performed is 0.35 and that this estimate is paired with an estimate of the value of cash dividends in the range of 0.85 to 0.90.[73]

137. The SFG (2013) study employs the same methodology as the SFG (2011) study, but extends the data set through to the end of 2012. The conclusion from that study is that:

> the conclusions from that earlier study remain valid when tested against the updated data set.[74]

Problems with the ERA approach

138. Vo, Gellard and Mero (2013) from the Economic Regulation Authority of Western Australia (**ERA**) have recently produced a drop-off study that essentially follows the methodology of the SFG studies.

[68] Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010).
[69] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraphs 18-19.
[70] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.
[71] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 29.
[72] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.
[73] SFG (2011), Paragraph 3.
[74] SFG (2013), Paragraph 6.

One important deviation from the SFG methodology is that the ERA study also presents results that are based on analysis that omits the standard market adjustment. The standard approach in dividend drop-off studies is to assume that, but for the dividend, the stock price would have followed the movement in the broad market over the ex-dividend day. That is, if the broad market index increases by 2% over the ex-dividend day, it is assumed that, but for the dividend, the particular stock would also have increased by 2%.

139. We are unaware of any recent paper in a peer-reviewed journal that does not make such an adjustment. It is not surprising, therefore, that the ERA would have to make the adjustment to "enable a comparison of results to those from other studies." [75]

140. However, the ERA study also reports results in the absence of this standard market adjustment on the basis that, but for the dividend, a particular stock price might have moved (over the ex-dividend day) by somewhat more or less than the market. For example, it is possible that when the broad market increases by 2%, a particular stock might have moved (but for the dividend) by 1.8% or by 2.2%.

141. Omitting the market adjustment entirely is certain to be an inferior estimate on average. Whereas individual stocks might have moved by somewhat more or less than the broad market, on average stocks will move exactly in accordance with the market index, by definition.[76] That is, the standard market adjustment produces estimates of "but for the dividend" stock price movements that are unbiased on average – in the sense that it is equally likely that (but for the dividend) the stock might have moved somewhat more or somewhat less than the broad market index. Omitting the market adjustment entirely is to assume that (but for the dividend) the stock price would not have moved at all. Such an omission creates a bias. If the broad market increased by 2% over the ex-dividend day, the assumption that the stock price would have been 0% is clearly likely to be a material under-estimate, on average.

142. The reason the ERA authors provide for reporting results that omit the standard market correction is that "applying the market correction is an unnecessary complication to an already complex econometric task." [77] However, the correction is necessary to produce unbiased and reliable estimates and it is *not* difficult to implement. Indeed the ERA has already implemented the standard approach in its own study. In fact, the only new information provided by the ERA study is to also show how the results would have looked if a non-standard and inferior methodology had been employed. For these reasons, our view is that the subset of the results in the ERA paper that are based on analysis that omits the standard market adjustment should receive no weight.

143. We note that the Guideline materials appear to agree with our submission on this point when concluding that:

> We consider the most relevant results from the Vo et al study relate to regressions with the market adjustment.[78]

144. When the standard market adjustment is performed, the ERA study confirms the results from the SFG studies. In particular, the SFG studies conclude that an appropriate value for theta is 0.35. The ERA study reports that, when the standard market correction is applied, the average estimate of theta

[75] ERA Rate of Return Guideline, Explanatory Statement, Paragraph 956.
[76] This is because the market portfolio is an average taken over all stocks.
[77] Vo, Gellard and Mero (2013), p. 32.
[78] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 174.

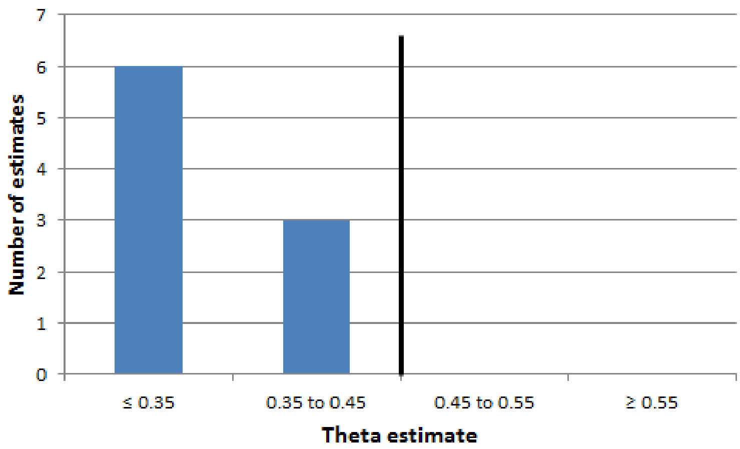
is 0.34. The estimate using robust regression and Model Specification 4 (which the ERA considers to be the most reliable estimate) is 0.33.[79]

145. Figure 4 below shows the distribution of all theta estimates where the market correction has been applied (except for the OLS estimates, which the ERA deems to be inappropriate.)[80] That figure also shows the mid-point of the proposed range, marked as a line. All of the estimates are below the mid-point and the majority are below the lower bound of the proposed range. From this, the Guideline materials conclude that:

> We consider the most relevant results from the Vo et al study relate to regressions with the market adjustment. From this basis, the sensitivity analysis (including different forms of the regression calculation) in the Vo et al paper still provides grounds to select an equity beta (sic) in the range 0.35–0.55, contrary to the ENA's submission.[81]

146. In our view, there is no basis for such a conclusion.

Figure 4. Distribution of ERA theta estimates: With market correction

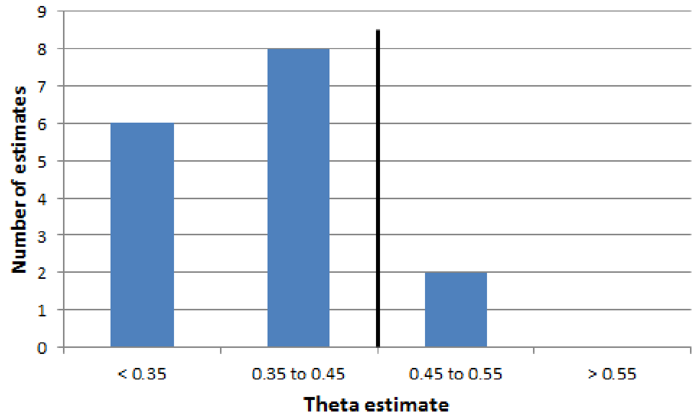


Source: Vo et al (2013), Table 5.

147. Even when no market correction is applied, Vo et al reports an average theta estimate of 0.40 and a robust regression estimate from Model Specification 4 of 0.32. In fact, there is very little evidence to support the Vo et al mid-point estimate of 0.45 at all. The Vo et al estimates of theta, with and without the market adjustment, are summarised in Figure 5 below. The figure shows that the vast majority of estimates fall below the ERA's mid-point estimate (marked as a line). Moreover, whereas a material number of estimates fall below the bottom of the range (less than 0.35) there are no estimates above the top end of the range (0.55).

[79] Vo, Gellard and Mero (2013), Table 5.
[80] Vo et al (2013), p. 9.
[81] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 174.

Figure 5. Distribution of ERA theta estimates



Source: Vo et al (2013), Table 5.

148. Finally, the ERA's sensitivity analysis (which is considered in some detail below) would seem to be irrelevant to the AER's Guideline given that the AER concludes that the relevant results are those that apply the standard market correction,[82] and the ERA's sensitivity analysis is applied exclusively to the results that do *not* apply the standard market correction.

Issues raised in relation to dividend drop-off analysis

149. The Guideline materials raise several issues in relation to dividend drop-off analysis, each of which is addressed in turn below.

Effect of additional trading around the ex-dividend event

150. The Guideline materials note that trading volumes tend to increase around ex-dividend dates and that dividend drop-off studies will estimate the value of imputation credits to those investors who are active in the market, in which case:

> By largely reflecting the abnormal trading conditions on the two relevant trading days, dividend drop off studies may not identify the market value for the representative investor.[83]

151. The ENA submission on the draft Guideline contained a detailed discussion on this point,[84] none of which has been addressed or acknowledged in the final Guideline materials. In that discussion, the ENA demonstrated that the empirical evidence shows that the increase in trading volume around ex-dividend dates is driven by a subset of investors who value imputation credits highly. These investors purchase shares to capture the dividend and imputation credit, causing a run-up in the cum-dividend price.[85]

152. To the extent that this effect is material, it results in the dividend drop-off being higher than it would otherwise be, which in turn results in the estimate of theta being higher than it would otherwise be.

[82] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 174.
[83] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 170.
[84] ENA Submission, 11 October 2013, Section 7.9, pp. 119-123.
[85] The same point is made by McKenzie and Partington (2011), pp. 9-10.

That is, to the extent that the increase in trading volume around the ex-dividend date has an effect, it is likely to result in an over-estimate of theta.

153. In our view, this evidence is relevant to the proper empirical estimation of theta.

Trading by "low valuation" shareholders.

154. The Guideline materials state that:

> if short term traders are highly involved in trading around the cum-dividend/ex-dividend dates, dividend drop off studies would underestimate the value of dividends and franking credits to those traders. This is because transaction costs are relatively higher as a proportion of expected returns for short term traders.[86]

155. The argument here is that short-term traders face relatively higher transactions costs and may therefore be willing to pay less for an imputation credit. If such traders dominate trading around the ex-dividend day, it can result in drop-off analyses underestimating theta.

156. The ENA submission on the draft Guideline contained a detailed discussion on this point,[87] none of which has been addressed or acknowledged in the final Guideline materials. In that discussion, the ENA demonstrates that:

   a) This argument is illogical. Suppose there was a set of "low value" investors who were willing to pay a lower price to buy shares cum-dividend. Why would anyone sell to them? Why wouldn't trades occur between sellers and those investors who were willing to pay a higher price?; and

   b) It is inconsistent with the relevant evidence. Whereas the low-value investor conjecture would lead to cum-dividend prices being depressed, there is evidence of a cum-dividend price run-up.[88]

157. In our view, this evidence is relevant to the proper empirical estimation of theta.

Allocation

158. The Guideline materials note that:

> Dividend drop off studies only 'directly' identify the combined value of dividends and the attached imputation credit. In order to determine an estimate of the utilisation rate, this combined value of dividends and attached imputation credits must be allocated between the two components. This is called 'the allocation problem' and is a critical issue with dividend drop off studies.[89]

159. The ENA submission on the draft Guideline contained a detailed discussion on this point,[90] none of which has been addressed or acknowledged in the final Guideline materials. In that discussion, the ENA establishes that the empirical literature has established a very consistent result – the combined

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[86] AER Rate of Return Guideline, Explanatory Statement, Appendix H. p. 170.
[87] ENA Submission, 11 October 2013, Section 7.9.3, pp. 121-122.
[88] See, for example, McKenzie and Partington (2011), pp. 9-10.
[89] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 167.
[90] ENA Submission, 11 October 2013, Section 7.10, pp. 123-127.

value of a one dollar dividend and the associated imputation credit is one dollar. The ENA submission shows that this result is reported by the dividend drop-off studies of SFG (2011), SFG (2013), Vo et al (2013), the futures studies of Cannavan, Finn and Gray (2004), Cummins and Frino (2008) and SFG (2013), and with the hybrid securities study of Feuerherdt, Gray and Hall (2010).

160. Moreover, in its 2009 WACC Review, the AER concluded that the relevant evidence at the time supported a combined value of one dollar.[91]

161. By contrast, the Guideline materials state that "dividends should be worth their face value"[92] and that "[a]ll Australian regulators assume that dividends are at face value within calculation of the cost of equity."[93] Thus, a $1 dividend is assumed to be valued at $1. Attached to that $1 dividend will be a 43 cent imputation credit that the AER assumes to be valued at 70% of its face value. The combined value is therefore $1 + 0.7 \times 0.43 = 1.30$. This combined value is materially higher than, and contradicted by, every empirical estimate of the combined value.

162. In our view, this evidence is relevant to the proper empirical estimation of theta.

163. Moreover, the ENA submission notes that the allocation of the combined value of one dollar between the dividend and the associated imputation credit is of little moment so long as it is applied consistently throughout a determination:

> For example, if the regulator determines that a particular value of cash dividends should be used, that value should be applied consistently throughout the determination. The value of theta that should be used is then that value that would result in the combined value being $1 – consistent with all of the available evidence.[94]

Stability and the effect of influential observations

164. The Guideline materials note that, whereas the SFG estimates have been shown to be stable and robust to the removal of influential observations, Vo et al (2013) report that:

> the estimate of theta is highly sensitive to the choice of the underlying sample of dividend events. Removing just 30 observations from a sample of 3309 can result in a dramatically different estimate of theta.[95]

165. The SFG (2011) study contained an extensive section on stability analysis[96] whereby observations are removed in pairs consisting of the observations that have the most influential upward and downward effects on the estimate of theta, respectively. As pairs of observations are removed, theta is re-estimated to determine the sensitivity of the theta estimate to influential observations. The result is a figure such as that replicated below for Model Specification 4.[97]

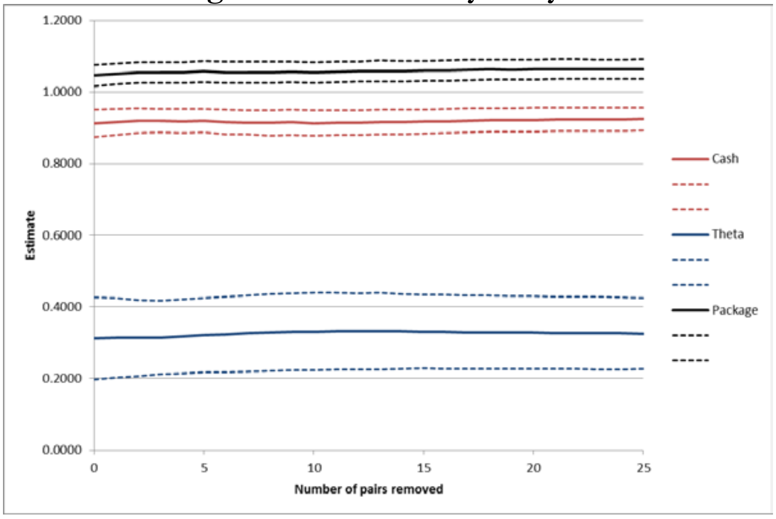
166. SFG (2011) conclude, on the basis of this stability analysis, that:

[91] AER 2009 WACC Review, Final Determination, p. 461.
[92] AER Draft Rate of Return Guideline, Explanatory Statement, p. 123.
[93] AER Draft Rate of Return Guideline, Explanatory Statement, p. 123, Footnote 338.
[94] ENA Submission, 11 October 2013, Section 7.10, p. 127.
[95] Vo et al (2013), p. 30.
[96] SFG (2011), pp. 28-32.
[97] This appeared as Figure 8, p. 31 in SFG (2011).

> The stability analysis for Model 4, in Figure 8 above, shows that the estimates of the value of cash dividends, the value of theta, and the value of the combined package are very stable and robust to the removal of pairs of influential data points…In summary, the stability analyses demonstrate that the estimates of theta are either maintained or lowered when pairs of influential observations are removed from the data set.[98]

167. SFG (2013) conduct a similar stability analysis for the updated data set and reach the same conclusion.

Figure 6. SFG stability analysis



Source: SFG (2011), Figure 8, p. 31.

168. Because the stability of theta estimates is clearly a key issue for Vo et al (2013) and for the AER's Guideline we conduct an even more extensive stability analysis, reporting the results in Appendix 9 to this report. The additional stability analyses corroborate the results from SFG (2011) and SFG (2013) – the SFG estimates of theta are stable and robust to the removal of influential outliers and even to the removal of up to 5% of the data sample.

Other econometric issues

169. The Guideline materials state that:

> There are a number of other well documented econometric problems with dividend drop off studies.[99]

and then proceeds to set out a bullet point list.

170. Every one of these issues was specifically addressed point-by-point in the ENA submission on the draft Guideline,[100] but none of that response has been addressed or acknowledged in the final Guideline materials. In our view, the ENA submission establishes that none of the issues set out in the Guideline materials are a cause for concern, and they certainly do not provide a basis for effectively disregarding the entire body of dividend drop-off evidence when estimating theta.

[98] SFG (2011), p. 31.
[99] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 168.
[100] ENA Submission, 11 October 2013, Section 7.11, pp. 127-132.

Difference between Lally and van Zijl (2003) "utilisation" and theta

171. Lally (2013, pp. 20-21) notes that asset pricing models such as Lally and van Zijl (2003) allow for dividends and capital gains to be differentially valued by investors. Specifically, these models provide for the possibility that dividends are relatively less valuable, in which case high-dividend-paying stocks require higher returns, other things being equal.

172. One reason why dividends may be less valuable than capital gains is that they are taxed more heavily for some investors. In a dividend imputation system, imputation credits are taxed in the same way as dividends – the dividend and the imputation credit are both included in taxable income and taxed at the investor's marginal rate. That is, to the extent that personal taxes result in dividends being less valuable than capital gains, the same would apply to imputation credits.

173. Of course there are many reasons why imputation credits would be even less valuable to investors than dividends, as set out in Section 2 above. These reasons include the fact that imputation credits are worthless to non-resident investors, there is a time delay in receiving them, there are administrative costs in redeeming them and there are portfolio diversification costs in acquiring them.

174. In summary, there are three categories of reasons why imputation credits are likely to have a value (as in "worth" or "price") that is less than their face value:

    a) Reasons that also apply to dividends (e.g., the possible effects of personal taxes);

    b) The fact that not all credits will be utilised; and

    c) Other reasons (e.g., there is a time delay in receiving them, there are administrative costs in redeeming them and there are portfolio diversification costs in acquiring them).

175. Dividend drop-off estimates of theta reflect the combined effect of all three categories. Models such as Lally and van Zijl (2003) separate out the first category of reasons when they specifically provide for the possibility that dividends might be less valuable than their face value. In these models, the value of dividends is defined to be δ. Lally (2013a, pp. 20-21) proposes that a similar disaggregation should be performed in the current setting whereby the dividend drop-off estimate of theta is disaggregated into two components:

$$\theta = \delta \times U .$$

176. For example, if theta is estimated to be 0.35 and if δ is estimated to be 0.875, the implied estimate of U is 0.40.[101] In this case, imputation credits are estimated to be worth 35% of their face value, part of which (0.875) is for reasons that are common to dividends and part of which (0.40) is for reasons that are unique to imputation credits.

177. Lally (2013a) recognises that if an estimate of theta (which already includes the effect of δ) is inserted into the model of Lally and van Zijl (2003), it would be multiplied by δ again (because such models separately deal with the reasons that are common to dividends), resulting in double-counting.

178. However, the Australian regulatory practice, and the approach that is proposed in the Guideline, is to use a model that does *not* separate theta into various components. The Guideline does not consider models such as Lally and van Zijl (2003) that allow for dividends to be valued at less than their face value. Rather,

[101] See Lally (2013), p. 21.

the Guideline approach is to make a single all-encompassing adjustment for the extent to which imputation credits are valued at less than face value.

179. In summary, whereas the model of Lally and van Zijl (2003) requires separate estimates of δ and U, the Guideline approach requires only a single combined estimate of theta. The Australian regulatory framework that is adopted in the Guideline determines gamma as $\gamma = F \times \theta$. It is exactly such an all-encompassing estimate of theta that is produced by dividend drop-off analysis.

180. Lally (2013a) proposes that U should be set to 1 by "ignoring foreigners."[102] This theoretically assumed utilisation rate could then be multiplied by an estimate of δ to obtain the estimate of theta that is required for implementation of the Australian regulatory framework that is adopted in the Guideline – whereby gamma is determined as $\gamma = F \times \theta$.

Conclusions in relation to dividend drop-off analysis

181. The Guideline materials conclude that the most relevant dividend drop-off studies are those by SFG and Vo et al, and that the most relevant results from Vo et al are those that apply the standard market correction. SFG report a theta estimate of 0.35. The Vo et al estimate (using the standard market correction) is 0.34.

182. In our view, to the extent to which there is any difference between the two studies, there are two reasons to prefer the SFG studies to the Vo et al study:

   a) The SFG approach has been subjected to intense scrutiny. All data and computer code was supplied to the AER. All issues that the AER has identified have been considered by the Tribunal. And the Tribunal has endorsed and adopted the results. By contrast, the Vo et al study has not been subjected to such scrutiny;[103] and

   b) The SFG theta estimates have been shown to be stable and reliable in the face of a battery of stability and robustness checks, whereas Vo et al express concerns about the stability and reliability of its own results.

183. In any event, there is little evidence to support the Vo et al mid-point estimate of 0.45 from within its range of 0.35 to 0.55:

   a) The Vo et al estimates are overwhelmingly below 0.45 (see Figure 5 above), and a significant proportion of those estimates are below 0.35;

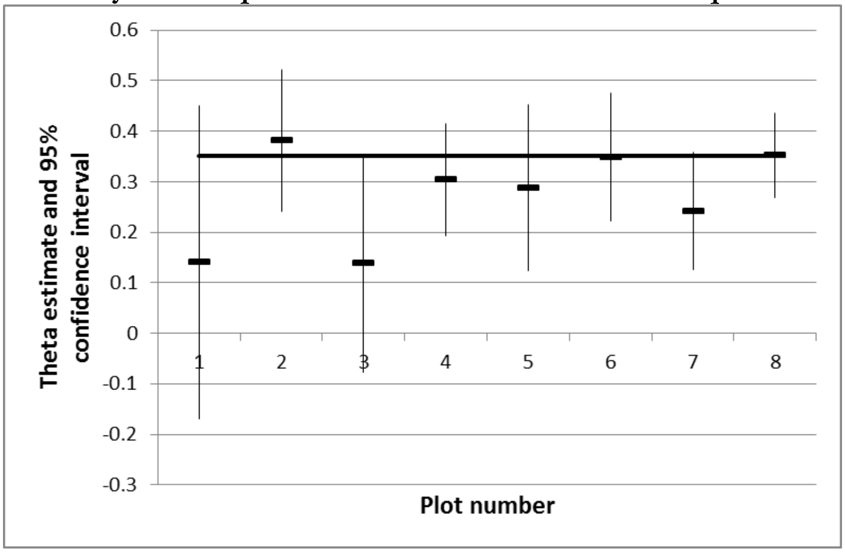
   b) The Vo et al study reports a theta estimate of 0.34 when the standard ex-day market correction is applied;

   c) The Vo et al estimate increases only to 0.4 when the standard ex-day market correction is removed; and

184. The SFG (2013) estimates indicate that, if anything, the 0.35 estimate is towards the upper end of the reasonable range. See for example Figure 7 below, which is reproduced from SFG (2013), Figure 5.

[102] Lally (2013), p. 3.
[103] Although we understand that the Vo et al (2013) study has so far been submitted to two academic journals.

Figure 7
Summary of point estimates and confidence intervals for theta by model specification and estimation technique



For each estimate, the narrow line represents the 95% confidence interval for theta and the solid black marker represents the point estimate. The solid black horizontal line represents the recommended point estimate of 0.35.

Plot 1: Model specification 1, OLS estimation; Plot 2: Model specification 2, OLS estimation;
Plot 3: Model specification 3, OLS estimation; Plot 4: Model specification 4, OLS estimation;
Plot 5: Model specification 1, RR estimation; Plot 6: Model specification 2, RR estimation;
Plot 7: Model specification 3, RR estimation; Plot 8: Model specification 4, RR estimation.

185. In our view, there is no reasonable basis for adopting a dividend drop-off estimate of theta above 0.35.

Other empirical evidence

186. In addition to the dividend drop-off studies above, there are a number of studies that employ alternative methodologies to estimate the value of distributed imputation credits. Like dividend drop-off studies, these studies also seek to determine the extent to which the value of imputation credits is capitalised into stock prices.

187. Dividend drop-off studies estimate the capitalised value of imputation credits by observing how stock prices change around ex-dividend events. The pre-dividend price reflects the value of the dividend and the associated credit whereas the ex-dividend price does not, so the change in price reflects the extent to which the dividend and imputation credit were capitalised into the stock price.

188. Simultaneous price studies compare the prices of securities that entitle the holder to receive dividends and imputation credits (such as 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 (such as futures contracts). SFG (2013) report an estimate of 0.13 using this approach.

189. Two more recent studies test whether (other things being equal) firms with higher imputation credit yields are valued more highly by investors. Both find that they are not. This implies that equilibrium stock prices are independent of the amount of imputation credits that they generate, which leads the authors to conclude that theta is not materially different from zero, in equilibrium.[104]

[104] Labcygier and Wheatley (2012) and Siau, Sault and Warren (2013).

190. 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]

191. 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.

[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.

6. Market practice

Evidence of market practice

Survey evidence and independent expert reports

192. When determining an appropriate value for gamma, one of the relevant pieces of evidence is the practice of market professionals. This section reviews the most recent regulatory analysis of market practice in relation to gamma.

193. As part of its consideration of the gamma parameter during its 2009 WACC Review, the AER considered a range of evidence about the practice of market professionals. That evidence showed that:

   a) The great majority of independent expert valuation reports make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (Lonergan, 2001[106]; KPMG, 2005[107]);

   b) The great majority of CFOs of major Australian companies (who between them account for more than 85% of the equity capital of listed Australian firms) make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (Truong, Partington and Peat, 2008[108]);

   c) Published Queensland Government Treasury valuation principles require government entities to make no adjustment at all to either cash flows or discount rates to reflect any assumed value of franking credits (OGOC, 2006[109]); and

   d) Credit rating agencies make no adjustments in relation to franking credits to any quantitative metric that they compute when developing credit ratings for Australian firms.

194. In a recent report for the ENA, SFG (2013)[110] reviewed independent expert reports from 2008 to 2013 and concluded that:

> None of the reports in our sample make any adjustment in relation to dividend imputation. No adjustments of any kind were made to any cash flows and no adjustments of any kind were made to any discount rates.[111]

195. This confirms that the long-established practice of independent expert valuation professionals making no adjustment in relation to imputation credits remains the current practice.

[106] Lonergan, W., 2001. "The Disappearing Returns: Why Imputation Has Not Reduced the Cost of Capital," *JASSA*, Autumn 1, 1–17.

[107] KPMG, 2005. "The Victorian Electricity Distribution Businesses Cost of Capital - Market practice in relation to imputation credits Victorian Electricity Distribution Price Review 2006 – 10."

[108] Truong, G., G. Partington, and M. Peat, 2008. "Cost of Capital Estimation and Capital Budgeting Practice in Australia," *Australian Journal of Management,* 33, 95 – 121.

[109] Queensland Government Treasury, 2006, "Government owned corporations – Cost of capital guidelines," www.ogoc.qld.gov.au.

[110] http://www.aer.gov.au/sites/default/files/Report%204%20-%20Use%20of%20Independent%20Expert%20Reports%20%28Final%29%20-%2026%20June.pdf.

[111] SFG (2013), p. 2.

196. By contrast, Lally (2013a) concludes that "there is a trend amongst practitioners towards explicit adjustments for imputation credits."[112] This appears to be based on a small survey conducted by KPMG (2013), which includes responses from six banks, six professional services firms, and six infrastructure funds.[113] No information is provided about which organisations responded to the survey, what the response rate was, which individuals within each organisation completed the survey or their qualifications or roles within the organisation. It is difficult to imagine that any survey could fare worse when compared against the criteria set out by the Tribunal for the use of survey information.[114]

197. Moreover, the largest group in the survey was infrastructure funds, who reported that they account for imputation credits in cash flows. Of course, the cash flows of any regulated infrastructure asset *are* adjusted for imputation credits – according to the regulator's estimate of gamma. To ignore this adjustment would be to misestimate the allowed cash flows. Consequently, it is far from clear that these responses should be treated as independent evidence.

198. In our view, there is strong evidence to support the notion that market practitioners generally make no adjustments in relation to imputation credits.

Equity imputation funds

199. Lally (2013a) notes that the AER has recently highlighted the existence of managed funds that focus on firms with high imputation credit payout rates. He concludes that "the existence of the funds implies that U is positive." [115]

200. The AER's Draft Explanatory Statement refers to an "informal survey"[116] that identifies the existence of a number of managed funds with a focus on investing in firms with a high imputation credit payout ratio. The Explanatory Statement does not indicate how many of these funds the AER has identified, the dollar volume of assets under management, the proportion of all funds that have an imputation yield focus, or any quantitative information whatsoever. The questions were not disclosed before the survey was conducted to enable comments from interested parties to be considered. Moreover, the Explanatory Statement does not indicate whether this evidence about the existence of imputation funds would cause its estimate of theta (or gamma) to be higher or lower than it would otherwise be, and by how much.

201. The existence of such funds suggests nothing more than that there exists a group of investors who value imputation credits higher than the value that is incorporated into market prices. A theta of 1 would imply that the full face value of imputation credits is capitalised into share prices, in which case shareholders would have to pay for the full face value of imputation credits when buying the shares. In this scenario, there would be zero demand for an imputation-focused fund. By contrast, a theta of 0 would imply that imputation credits are not reflected in stock prices at all, in which case it is investors (rather than firms) who benefit from imputation. In this scenario, an individual investor who valued imputation credits may benefit from investing in a fund that focused on firms with high imputation yields. That is, the demand for imputation-focused funds will be inversely related to theta – a higher theta means that more of the value of imputation credits is already capitalised into the stock price, in which case investors would be paying for the benefit that they might receive from those credits.

[112] Lally (2013a), p. 32.
[113] http://www.kpmg.com/AU/en/IssuesAndInsights/ArticlesPublications/valuation-practices-survey/Documents/valuation-practices-survey-2013-v3.pdf.
[114] Application by Envestra Ltd (No 2), ACompT 3, Paragraphs 162-163.
[115] Lally (2013a), p. 37.
[116] AER Draft Rate of Return Guideline, Explanatory Statement, p. 136.

202. The mere fact that we observe that a number of imputation funds exist tells us nothing more than that there exists a group of investors who value imputation credits higher than the equilibrium value that is incorporated into market prices. It is not clear that anything can be concluded from this evidence, other than that theta must not be equal to 1.

Dividend washing

203. The AER's Draft Explanatory Statement refers to the change in tax policy to prevent certain investors from being able to effectively double the amount of imputation credits they receive via a process known as "dividend washing." The AER notes that some investors did engage in the practice of dividend washing, which "suggests that imputation credits are significantly valuable to these particular investors."[117] Of course, this tells us nothing at all about the equilibrium value of imputation credits, just that a very small subset of investors[118] have some positive valuation.

Summary

204. In relation to market practice, our view is that the clear evidence is that the majority of market practitioners do not make any adjustment for the value of imputation credits.

Regulatory consideration of market practice

205. In its 2009 WACC Review Final Decision, the AER concluded that:

> The AER agrees that the clear evidence is that the majority of market practitioners do not make any adjustment for the value of imputation credits.[119]

206. However, the AER concluded that there are at least two reasons why market professionals might not make any adjustment in relation to imputation credits:

a) No adjustment would be observed if market professionals considered that imputation credits had no material effect on the equilibrium stock price or on the equilibrium cost of equity; or

b) No adjustment would be observed if market professionals were using an approach that enabled them to bypass the need to estimate gamma.

207. The second alternative was raised in Handley (2008), a report commissioned by the AER.[120] Handley notes that the ultimate task of the regulator is to estimate the ex-imputation required return on equity, defined as:

$$r_e^* = r_e\left[\frac{1-T}{1-T(1-\gamma)}\right]$$

208. For example, if the total required return on equity is estimated to be $r_e = 10\%$ and if $T = 30\%$ and $\gamma = 0.5$, the ex-imputation required return is $r_e^* = 8.2\%$. In this case, shareholders require a total

[117] AER Draft Rate of Return Guideline, Explanatory Statement, p. 136.

[118] The AER Draft Rate of Return Guideline, Explanatory Statement (p. 136) notes that the total effect is anticipated to be only $20 million per year.

[119] AER 2009 WACC Review, Final Decision, p. 407.

[120] Handley, J., 2008." A note on the value of imputation credits," December, www.aer.gov.au/content/index.phtml/itemId/722190.

return of 10%, but the regulator sets prices or revenues so that the firm can provide a return of 8.2%, with the remaining 1.8% assumed to come from the value of imputation credits.

209. The regulatory approach for estimating r_e^*, the ex-imputation required return on equity (which determines the regulated firm's revenue allowance), involves two steps. First, the regulator estimates r_e, the total return on equity, including imputation credits. The AER's proposed approach is to estimate r_e using the Sharpe-Lintner CAPM with an estimate of MRP that is grossed-up to incorporate the assumed value of imputation credits. Then, the regulator removes the assumed effect of imputation credits via the adjustment formula set out above.[121]

210. Handley (2008) advised the AER that market professionals may be using what he called the "conventional" or "classical" approach to estimate r_e^* directly, without the need for an estimate of gamma at all. Under the SL CAPM, for example, r_e^* could be estimated directly in a single step by simply using an estimate of MRP that had not been grossed-up to reflect the assumed value of imputation credits.

211. In summary, the regulated firm's revenue requirement must be set so that the firm is able to pay a return of r_e^* to its shareholders. According to Handley (2008), there are two ways to estimate r_e^*:

a) Use the two-step regulatory approach to estimate r_e^*; or

b) Use the direct conventional (or classical) approach to estimate r_e^* that is used by market professionals.

212. In its 2009 WACC Review, the AER accepted the advice of Handley (2008), concluding that:

> On this basis the AER considers it is clear that there is a valid valuation framework (i.e. the classical approach) that would avoid the need to directly estimate gamma. It is quite possible and plausible that market practitioners are consciously choosing to adopt this simpler approach to estimating the cost of equity. To reiterate, as the NER require the AER to estimate gamma in calculating the tax building block (i.e. the 'assumed utilisation of imputation credits'), the classical valuation approach is not available.[122]

213. The AER approach has been to estimate r_e^* using only the two-step approach set out above. Information about the conventional or classical approach for estimating r_e^* has been used only for the purpose of explaining away the evidence about the dominant market practice being to make no adjustment for imputation credits.

214. In our view, the AER should at least compare its estimate of r_e^* with the estimate of r_e^* that would be obtained using the conventional or classical approach. It would not be appropriate for a regulator to raise the existence of the conventional or classical approach for the purpose of explaining away

[121] It is well known that the effect of the Australian regulatory framework is to reduce the allowed return to equity according to the formula above. This reduction in return is implemented by adjusting the taxation component of the revenue requirement.
[122] AER 2009 WACC Review, Final Decision, p. 409.

evidence of market practice, but then to not compare its own estimate of r_e^* with the corresponding estimate obtained under the conventional or classical approach.

215. Lally (2013) also addresses this point. He confirms that the conventional approach is to use an ex-imputation required return on equity (defined as r_e^* above) that market professionals may estimate directly and that the regulatory approach is to first gross-up this required return to include the assumed value of imputation credits and to then remove their assumed value when calculating the regulated revenue requirement.[123]

216. Again, the conclusion is that the AER should at least compare its estimate of r_e^* with the estimate of r_e^* that would be obtained using the conventional or classical approach.

Conclusions in relation to market practice

217. There is clear evidence that the dominant market practice is to make no adjustment for imputation credits – to consider that the firm must generate the entire return that investors require and that there is no reduction due to imputation credits.

218. If the AER disregards this evidence on the basis that there is a "conventional" or "classical" approach that can be used to estimate the ex-imputation required return on equity without requiring an estimate of gamma, the estimate from that approach should at least be compared with the corresponding estimate from the regulatory approach. Good regulatory practice would then involve the AER explaining why its estimate of the ex-imputation required return on equity (which forms the basis of the allowed revenue) differed from the "conventional" estimate.

[123] Lally (2013), p. 27.

7. Conclusions and recommendations

219. As set out in Section 3 of this report, our view is that the best available estimate of the distribution rate is 0.7.

220. As set out in Section 4 of this report, our view is that the best available estimate of theta (from dividend drop-off analysis) is 0.35 and that that this is a conservative estimate in that the other relevant evidence (which has not yet been subjected to the same degree of scrutiny) suggests lower estimates.

221. Consequently, it is our view that the best available estimate of gamma at the current time is 0.25:

$$\gamma = F \times \theta = 0.7 \times 0.35 = 0.25.$$

Declaration

222. 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

AA15-570-0054

Version B – 7 May 2014

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A	Draft	07/02/14	E Grace-Webb		
B	Final	07/05/14	E Grace-Webb		E Grace-Webb

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 is currently preparing its revised Access Arrangement proposal (**Project**) with supporting information for the consideration of the Australian Energy Regulator (**AER**). The revised access arrangement will cover the period 1 July 2015 to 30 June 2020 (July to June financial years).

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.

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.

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(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

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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 this context, the independent opinion of SFG, as a suitably qualified independent expert (**Expert**), is sought on the value of imputation credits (γ or gamma) to be applied in estimating the cost of corporate income tax. JGN seeks this opinion on behalf of itself, ActewAGL, APA, Energex, Ergon, Networks NSW, Transend, TransGrid, and SA PowerNetworks.

2 Scope of Work

The Expert will provide an opinion report that:

1. Clearly describes the conceptual economic / finance basis for accounting for the value of imputation credits when estimating the cost of corporate income tax as part of a post-tax building block revenue framework where the building blocks are as set out in rule 76 (for gas distribution and transmission), clause 6A.5.4(a) (for electricity transmission), and 6.4.3(a) (for electricity distribution);

2. Assesses each of the methods identified by the AER for estimating the value of imputation credits in the rate of return guidelines, as well as any other methods the Expert may consider to be relevant, in terms of:

   (a) their suitability for estimating the value of imputation credits within the building block revenue framework, in light of the conceptual economic / finance basis for this parameter; and

   (b) the reliability and robustness of estimates produced by each method;

3. Provides the Expert's opinion on the best method, or combination of methods, for estimating the value of imputation credits within the building block revenue framework; and

4. Provides an estimate of the value of imputation credits, based on the recommended method, or combination of methods.

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.

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 [1];
- 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

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

- (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 **9 May 2014**.

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.

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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[2], 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[3]

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[4]

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

---

2 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].

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

4 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[5]; 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[6].

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[7].

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

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

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

[7] 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

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Academic Qualifications

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

Employment History

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

Academic Awards

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

Large Grants (over $100, 000)

- Australian Research Council Linkage Grant, 2008—2010, Managing Asymmetry Risk ($320,000), with T. Brailsford, J.Alcock, and Tactical Global Management.
- Intelligent Grid Cluster, Distributed Energy – CSIRO Energy Transformed Flagship Collaboration Cluster Grant, 2008-2010 ($552,000)
- Australian Research Council Research Infrastructure Block Grant, 2007—2008, Australian Financial Information Database ($279,754).
- Australian Research Council Discovery Grant, 2006—2008, Capital Management in a Stochastic Earnings Environment ($270,000).
- Australian Research Council Discovery Grant, 2005—2007, Australian Cost of Equity.
- Australian Research Council Discovery Grant, 2002—2004, Quantification Issues in Corporate Valuation, the Cost of Capital, and Optimal Capital Structure.

- Australian Research Council Strategic Partnership Grant, 1997—2000, Electricity Contracts and Securities in a Deregulated Market: Valuation and Risk Management for Market Participants.

Current Research Interests

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

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Teaching

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

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

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

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

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

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

Board Positions

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

Consulting

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

Consulting interests and specialties, with recent examples, include:

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

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

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

- **Valuation**

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

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

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

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

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

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

Appendix 3: The conceptual interpretation of gamma and theta

223. In this appendix, we consider a standard dividend imputation setting in which a company generates profits in Australia, pays corporate tax, and then distributes franked dividends to its shareholders. We follow the standard notation in defining F to be the proportion of created credits that are distributed to shareholders and θ to be the equilibrium value of distributed credits. We also follow the standard approach of defining gamma to be the product if these two parameters:

$$\gamma = F \times \theta \tag{1}$$

224. In our initial example, we consider a simple case in which the company distributes all of the credits that it creates (in which case $F = 1$) and where 50% of the face value of distributed credits are reflected in the stock price. In this case:

$$\gamma = F \times \theta = 1 \times 0.5 = 0.5.$$

225. We also consider a company with an initial stock price of $S_0 = 100$ and required return on equity of $r_e = 10\%$.

226. Officer (1994) shows that, in this setting, the proportion of the required return on equity that is due to dividends is:[124]

$$G = \frac{1-T}{1-T(1-\gamma)} \tag{2}$$

and that the proportion of the required return on equity that is due to imputation credits is:

$$(1-G) = \frac{\gamma T}{1-T(1-\gamma)} \tag{3}$$

where T is the corporate tax rate, which we set to 30% in this example.

227. In this case, the proportion of the required return from dividends is:

$$\frac{1-T}{1-T(1-\gamma)} = \frac{1-0.3}{1-0.3(1-0.5)} = 82.4\%$$

and the proportion from imputation credits is:

$$\frac{\gamma T}{1-T(1-\gamma)} = \frac{0.5 \times 0.3}{1-0.3(1-0.5)} = 17.6\%.$$

228. Since the total required return on equity is 10% in this case, a return of 8.24% is required from dividends and the remaining 1.76% will come from imputation credits. Note that there are no capital gains in this constant perpetuity setting – post-tax profit is the same every year in perpetuity and all of this profit is paid out in full as a dividend.

[124] We define this term to be G to simplify the following derivations.

229. That is, in equilibrium, every year the $100 stock generates a dividend of $8.24 and imputation credits that have a value of $1.76. The stream of dividends and imputation credits are both level perpetuities in this framework, so their present value can be written as:

$$\frac{8.24}{0.1}+\frac{1.76}{0.1}=82.4+17.6=100.$$

230. In this case, dividends represent 82.4% of the value of equity and the remaining 17.6% is due to imputation credits.

231. To fund the required streams of dividends and imputation credits, the company must generate pre-tax profit (Y_1) of:

$$Y_1=\frac{Gr_eS_0}{1-T}=\frac{0.824\times 0.10\times 100}{1-0.3}=11.77. \tag{4}$$

232. That is, the company generates pre-tax profit of $11.77 and pays tax of $3.53,[125] leaving $8.24 to be paid out as a dividend. The corporate tax payment generates imputation credits with a face value of $3.53. These credits are distributed to shareholders who value them at half their face value (because $\theta=0.5$), which is $1.76.

233. In this case, the current stock price will be equal to the sum of the present values of the dividend, imputation credits, and end-of-year stock price:

$$S_0=\frac{Div_1+\theta\times Tax_1+S_1}{1+r_e}=\frac{8.24+0.5\times 3.51+100}{1.10}=100. \tag{5}$$

234. Now consider the case where some fraction of the post-tax profit is retained within the firm. In particular, we consider the case where the firm distributes 70% of its post-tax profit as a dividend to shareholders. This also implies that the firm will distribute 70% of the imputation credits that are created by the payment of corporate tax. In this example, we assume that 70% of the face value of imputation credits are reflected in the stock price, in which case we have:

$$\gamma=F\times\theta=0.7\times 0.7=0.49.$$

235. In this case, we have:

$$G=\frac{1-0.3}{1-0.3(1-0.49)}=0.826. \tag{6}$$

236. We also assume that the 30% of post-tax profits that are reinvested back into the firm will earn the normal return of 10% p.a.

237. In this case, the required pre-tax profit is:

$$Y_1=\frac{Gr_eS_0}{1-T}=\frac{0.826\times 0.10\times 100}{1-0.3}=11.81$$

and the dividend paid is equal to a fraction of post-tax profit:

[125] 30% of 11.77 is 3.53.

$$Div_1 = Y_1(1-T)F = 11.81(1-0.3)0.7 = 5.79\,. \qquad (7)$$

238. Also note that the amount of post-tax profit that is reinvested is $Y_1(1-T)(1-F)$. Since this reinvestment is assumed to earn a normal return, it will have a value equal to the amount invested. Consequently, the end-of-year stock price will be:

$$S_1 = S_0 + Y_1(1-T)(1-F) = 100 + 11.77(1-0.3)(1-0.7) = 102.48\,. \qquad (8)$$

239. The amount of imputation credits that are created equals the amount of corporate tax that is paid (30% of 11.81 is 3.54). However, only proportion F of this corporate tax is distributed as imputation credits:

$$IC_1 = Y_1TF = 11.81 \times 0.3 \times 0.7 = 2.48. \qquad (9)$$

240. Since $\theta = 0.7$, 70% of the face value of imputation credits is incorporated into the stock price – $0.7 \times 2.48 = 1.74.$

241. The current stock price can be written as the present value of the dividends, imputation credits and end-of-year stock price:

$$\begin{aligned} S_0 &= \frac{Y_1(1-T)F + \theta \times Y_1TF + S_1}{1+r_e} \\ &= \frac{11.81(1-0.3)0.7 + 0.7 \times 11.81 \times 0.3 \times 0.7 + 102.48}{1.10} = 100. \end{aligned} \qquad (10)$$

242. Now, substituting the expression for pre-tax profit in Equation (4) into Equation (8) yields:

$$S_1 = S_0 + \frac{Gr_eS_0}{1-T}(1-T)(1-F) = S_0(1+Gr_e(1-F)). \qquad (11)$$

243. That is, the growth rate in the stock price is:

$$g = Gr_e(1-F). \qquad (12)$$

244. This same growth rate will also apply to dividends and the amount of imputation credits that are distributed each year. In this case, the growth rate is:

$$g = 0.826 \times 0.10(1-0.7) = 2.48\%\,.$$

245. With this constant growth rate, the present value of dividends can be written as:

$$PV(Divs) = \frac{Div_1}{r_e - g}. \qquad (13)$$

246. Substituting the expression for growth in Equation (12) and the expression for Div_1 in Equation (7) into Equation (13) yields:

$$PV(Divs) = \frac{Div_1}{r_e - g} = \frac{Y_1(1-T)F}{r_e - Gr_e(1-F)} = \frac{5.79}{0.10 - 0.248} = 76.92\,. \qquad (14)$$

247. Substituting the expression for pre-tax profit in Equation (4) into Equation (14) yields:

$$PV(Divs) = \frac{\frac{Gr_e S_0}{1-T}(1-T)F}{r_e - Gr_e(1-F)} = \frac{GF}{1-G(1-F)} S_0 . \tag{15}$$

248. Now, substituting the expression for G in Equation (2) into Equation (15) yields:

$$PV(Divs) = \frac{GF}{1-G+GF} S_0 = \frac{\frac{1-T}{1-T(1-\gamma)}F}{\frac{\gamma T}{1-T(1-\gamma)} + \frac{1-T}{1-T(1-\gamma)}F} S_0 = \frac{(1-T)F}{\gamma T + (1-T)F} S_0 \tag{16}$$

249. Finally, substituting in the expression for gamma in Equation (1) into Equation (16) yields:

$$PV(Divs) = \frac{(1-T)F}{F\theta T + (1-T)F} S_0 = \frac{1-T}{1-T(1-\theta)} S_0 . \tag{17}$$

250. That is, the proportion of the stock price that is due to dividends is $\frac{1-T}{1-T(1-\theta)}$. In this case we have:

$$PV(Divs) = \frac{1-T}{1-T(1-\theta)} S_0 = \frac{1-0.3}{1-0.3(1-0.7)} 100 = 0.769 \times 100 = 76.9.$$

251. A similar derivation shows that the proportion of the stock price that is due to imputation credits is:

$$1 - \frac{1-T}{1-T(1-\theta)} = \frac{\theta T}{1-T(1-\theta)} .$$

252. In this case we have:

$$PV(IC) = \frac{\theta T}{1-T(1-\theta)} S_0 = \frac{0.7 \times 0.3}{1-0.3(1-0.7)} 100 = 0.231 \times 100 = 23.1.$$

253. Another way to see the results set out above is to note that the total required return on equity is composed of dividends, capital gains and imputation credits:

$$r_e = r_{divs} + r_{cap\,gains} + r_{IC} \tag{18}$$

254. Now, note that for every F dollars of dividends, there are $1-F$ dollars of capital gains. This implies that for every dollar of dividends there are $\frac{1-F}{F}$ dollars of capital gains, in which case:

$$r_{cap\,gains} = \frac{1-F}{F} r_{divs} .$$

255. Also note that there are $\frac{T}{1-T}$ imputation credits attached to every dollar of dividends, each of which has an equilibrium value of θ. This implies that for every dollar of dividends there are imputation credits worth $\frac{\theta T}{1-T}$, in which case:

$$r_{IC} = \frac{\theta T}{1-T} r_{divs}.$$

256. Substituting these results into Equation (18) yields:

$$\begin{aligned} r_e &= r_{divs} + \frac{1-F}{F} r_{divs} + \frac{\theta T}{1-T} r_{divs} \\ &= \left(1 + \frac{1-F}{F} + \frac{\theta T}{1-T}\right) r_{divs} \\ &= \left(\frac{1-T+F\theta T}{F(1-T)}\right) r_{divs} \\ &= \left(\frac{1-T(1-\gamma)}{F(1-T)}\right) r_{divs}. \end{aligned}$$

257. That is, each year the proportion of the return that is due to dividends is:

$$\frac{r_{divs}}{r_e} = \frac{F(1-T)}{1-T(1-\gamma)}.$$

258. It follows that the proportion of the return that is due to capital gains is:

$$\frac{r_{cap\,gains}}{r_e} = \frac{1-F}{F}\left(\frac{F(1-T)}{1-T(1-\gamma)}\right) = \frac{(1-F)(1-T)}{1-T(1-\gamma)},$$

in which case the proportion of the return that is due to dividends and capital gains collectively is:

$$\frac{r_{divs+cap\,gains}}{r_e} = \frac{(1-T)}{1-T(1-\gamma)}.$$

259. Similarly, the proportion of the return that is due to imputation credits is:

$$\frac{r_{IC}}{r_e} = \frac{\theta T}{1-T}\left(\frac{F(1-T)}{1-T(1-\gamma)}\right) = \frac{\gamma T}{1-T(1-\gamma)}.$$

260. Now note that the current stock price can be written as:

$$S_0 = PV(Divs) + PV(IC).$$

261. Since every dollar of dividends is accompanied by imputation credits with an equilibrium value of $\frac{\theta T}{1-T}$, we have:

$$S_0 = PV(Divs) + \frac{\theta T}{1-T} PV(Divs) = \frac{1-T+\theta T}{1-T} PV(Divs)$$

262. This implies that the proportion of the current stock price that is due to the future stream of dividends is:

$$\frac{PV(Divs)}{S_0} = \frac{1-T}{1-T+\theta T}.$$

263. Consequently, the proportion of the current stock price that is due to the future stream of imputation credits is:

$$\frac{PV(IC)}{S_0} = \frac{\theta T}{1-T} \frac{1-T}{1-T+\theta T} = \frac{\theta T}{1-T+\theta T}.$$

264. These expressions for the relative proportions of annual returns and the relative proportions of the current stock price can be reconciled by noting that the capital gains reflect the fact that reinvested funds will result in a future increase in the amount of both dividends and imputation credits. That is, some of the capital gain reflects the increase in future dividends and some reflects the increase in future imputation credits – in the ratio of $1 : \frac{\theta T}{1-T}$. Assigning the annual capital gain in this proportion, reconciles the annual return calculations with the current stock price calculations above.

Appendix 4: The Lally (2013) estimate of the distribution rate

An empirical estimate based on observable data

265. In relation to the distribution rate, Lally (2013a,[126] pp. 53-54) discusses why the 100% value that the AER adopted in its 2009 WACC review, based on advice from Handley (2008), is flawed and unsupportable. This simply confirms the view of the Tribunal and indeed the AER's own submissions to the Tribunal in the *Gamma* Case. Lally concludes that:

> the various theory-based arguments (all for a distribution rate of 1) are not justified, and therefore an empirical estimate is warranted.[127]

266. We agree with the conclusion that an empirical estimate is warranted and note that it is consistent with regulatory practice and with the views of other expert advice to the AER.

267. The advice from Handley (2008), on which the AER relied for its 2009 WACC Review, was that undistributed credits should be treated as though they were distributed on the basis that they may be distributed at some time in the future. Lally (2013a) specifically rejects that argument, concluding that the observed payout rate in the historical data should be used:

> Since there is no reasonable basis for estimating what proportion of these undistributed credits will ever be distributed, and it seems unlikely that most of them will ever be, I recommend that the historical data be used to estimate the distribution rate.

268. We also agree with the conclusion that the distribution rate should be estimated as the observed payout rate in the historical data and we note that there is general agreement on this point.

269. In summary, Lally (2013a) concludes that the distribution rate should be estimated empirically using observable data about the proportion of imputation credits that are actually distributed in practice. We agree with this conclusion and note that it has consistent with regulatory practice and with the views of other expert advice to the AER.

Empirical estimates of the distribution rate

270. Lally (2013a) has regard to two empirical estimates of the distribution rate:

    a) The 70% estimate that is based on Australian Tax Office data and which is generally accepted, as set out above; and

    b) His own analysis of a sample of ten companies, which produces an estimate that "would appear to be over 90%."[128]

271. As set out above, the widely accepted empirical estimate is 0.7. This is based on what NERA (2013) refers to as the "cumulative payout ratio." In fact, the AER's Draft Rate of Return Guideline Explanatory Statement explicitly sets out that approach and notes that its estimate of the distribution rate will be based on that approach. In relation to the implementation of that approach, and the data required for it, the AER concludes that:

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[126] Lally, M., 2013, *The Estimation of Gamma*, Report for the AER, 23 November.
[127] Lally (2013a), p. 54.
[128] Lally (2013a), p. 52.

> We consider this is a reasonable approach to estimate the payout ratio. In particular, we consider it is simple, fit for purpose, transparent, replicable and based on reliable and publicly accessible data sets.[129]

272. Lally (2013a) questions the reliability of the data and the resulting estimates. For example, he states that:

> The ATO data suggests a figure of 70% but NERA (2013a) identifies some difficulties in the underlying data.[130]

273. This leads Lally (2013) to seek to produce his own estimate of the distribution rate by extrapolating payout ratios from a sample of ten companies. Nowhere does he explain what "concerns" or "difficulties" he might have with the ATO data that forms the basis of the estimate that is used by everyone else.[131]

274. Moreover, NERA (2013) note that their estimate of the distribution rate may, if anything, be *upwardly* biased. In particular, the data is available in the form of end-of-year franking account balances. Consequently, if the franking account balance is not reported for a particular firm, the credits in that firm's previous franking account are treated as having been distributed during the year. However, some firms simply neglect to report the franking account balance. In addition, any firm that becomes bankrupt during the year will no report a franking balance, and in those cases the franking credits are generally never distributed.[132]

Lally approach produces unstable estimates, relative to the standard approach

275. In his report for the QCA's 2004 WACC review, Lally (2004) refers to his estimate of the distribution rate for eight companies and recommends that the distribution rate should be set to 100% on the basis of that analysis.[133] The QCA rejected that recommendation in 2004. In a recent report for the QCA, Lally (2013b)[134] extends the sample of firms from 8 to 10 and the estimate falls from 100% to 85%.

276. Lally (2013a) himself notes that estimates from the accepted approach (by a range of authors) have been 0.69, 0.71, 0.69, and 0.70 and that "the consistency in these estimates encourages confidence in them."[135] Clearly, they are much more consistent than the estimates produced by his own small sample approach. In our view, the stable estimates from the accepted approach should not be rejected on the basis of unstated "concerns" or "difficulties."

277. Another relevant consideration is the role of foreign sourced profits. Suppose the average company distributes 70% of its profits as dividends. In general, a company with 30% or more of its profits from overseas operations will be able to distribute all of the imputation credits that it creates. Very large companies (such as the ten that Lally (2013a,b) examines) are unlikely to be representative of the broader market. For example, they are more likely to have more overseas profits than the average firm – and certainly more overseas profits than the benchmark regulated firm. Consequently, it is not

[129] AER Draft Rate of Return Guideline, Explanatory Statement, p. 236.
[130] Lally (2013a), p. 51.
[131] Whereas a number of concerns have been raised in relation to the quality of the ATO data on the *redemption* of imputation credits, no material concerns have been raised in relation to the data on the *distribution* of imputation credits.
[132] NERA (2013), p. 5.
[133] Lally (2004), p. 40.
[134] Lally, M., 2013, *Estimating Gamma*, Report for the QCA, 25 November.
[135] Lally (2013a), p. 50.

clear that the Lally approach is capable of producing an appropriate estimate of the distribution rate in any event.

Lally recommendations on the distribution rate

278. In his recent report for the AER, Lally (2013a) recommends:

> an estimate for the distribution rate of at least 70%.[136]

279. In his report for the QCA (dated two days later and based on the same set of evidence) Lally (2013b) recommends that:

> the estimated market-level distribution rate is 85%.[137]

Conclusions and recommendations

280. We conclude that the Lally small sample approach should receive no weight because:

a) It produces highly variable estimates over time, including materially different recommendations two days apart, whereas the accepted approach produces stable estimates;

b) The Lally approach is motivated only by unspecified problems with the ATO data. Whereas there are known to be problems with ATO redemption rate data, no issues have been raised in relation to the distribution rate data; and

c) The small sample of firms used in the Lally approach are not indicative of either the average firm or the benchmark regulated firm.

[136] Lally (2013a), pp. 5, 54.
[137] Lally (2013b), p. 5.

Appendix 5: The conceptual definition of theta

Terminology: "Utilisation rate" and "theta"

281. When discussing the conceptual role of theta, the first issue to address is one of terminology. In its 2009 WACC Review, the AER used the terms "theta" and "utilisation rate" interchangeably. For example, the AER referred to:

> the utilisation rate (commonly referred to as 'theta')[138]

and:

> Recent estimates of the utilisation rate (theta).[139]

282. The rationale for equating the terms "utilisation rate" and "theta" is set out in Lally (2013a). He uses U to represent the utilisation rate and proposes that:

$$\theta = \delta \times U$$

where δ represents the implied value of a dollar of cash dividends. Since the AER fixes $\delta = 1$ throughout its process for determining the allowed return on equity, it follows that the terms "utilisation rate" and "theta" are equivalent under the AER framework. Lally (2013a) suggests that the AER should consider more complex models for determining the allowed return on equity that do not require that the value of cash dividends be fixed at $\delta = 1$. Examples include Lally (1992) and Lally and van Zijl (2003). However, the AER has maintained its approach of fixing $\delta = 1$ throughout its current Guideline.

283. As set out in Section 2 above, it is generally accepted that gamma must be estimated as the product of two components: $\gamma = F \times \theta$. The fact that the Rules define gamma to be "the value of imputation credits"[140] would seem to imply that theta must be interpreted as "the value of distributed imputation credits." Moreover, from the discussion above, it does not matter whether the second parameter is called "theta" or "utilisation rate" or "the parameter that must be multiplied by F to obtain gamma." It also does not matter what symbol is used for this parameter – the point is that under the Rules that second parameter must be interpreted as "the value of distributed imputation credits."[141]

284. The only question then is what is meant by "the value of distributed imputation credits." Prior to the current Guideline, the AER interpreted value to mean "worth" or "price" – the value to the market. This remains the interpretation adopted by every other regulator. The Guideline now proposes a materially different interpretation that is examined in detail below.

[138] AER 2009 WACC Review Final Determination, p. 398.
[139] AER 2009 WACC Review Final Determination, Table 10.4, p. 399.
[140] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).
[141] This interpretation is also consistent with the Revenue and Pricing Principles, which require that "a reference tariff should allow for a return commensurate with the regulatory and commercial risks involved" and that "a service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs." In the regulatory setting, the regulator first determines the required return on equity, then sets the allowed revenues so that the sum of the allowed return on equity and the assumed value of imputation credits equals the required return on equity. If the regulator over- or under-estimates the value of franking credits, investors will be under- or over-compensated. In such a case, the return that equity holders receive is not commensurate with the regulatory and commercial risks involved or with the efficient costs the service provider incurs.

The Guideline's "re-evaluation of the conceptual task"[142]

Overview of the conceptual re-evaluation

285. In its 2009 WACC Review the AER interpreted theta as:

> the per dollar value of a distributed credit.[143]

286. 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.[144]

287. As part of its recent Guideline process, the AER has conducted a "conceptual re-evaluation" of the task and now interprets theta as the redemption rate (the average proportion of distributed credits that shareholders are able to redeem):

> the extent to which investors can use the imputation credits they receive to reduce their personal tax.[145]

288. By way of analogy, consider the task of determining the greatest ever one-day international (ODI) cricketer. There would be a range of views about what method should be employed to answer this question. One proposal might be that the greatest ever one-day cricketer is estimated as the person who captained his team for the longest period. However, it seems likely that any expert tribunal would reject that approach as an inappropriate estimate because it completely ignores the wealth of relevant empirical data that is available. This problem for the proponent of that method is not solved by the proponent conducting a conceptual re-evaluation and concluding that "best" actually meant "longest captaining" all along (if only you think about it carefully enough) – providing a means of reviving the approach that has already been rejected.[146]

Summary of the conceptual re-evaluation

289. In conducting its conceptual re-evaluation, the AER begins with the definition of the relevant market, concluding that the definition that it adopted for its 2009 WACC Review remains appropriate:

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142 AER Rate of Return Guideline, Explanatory Statement, p. 160.
143 AER 2009 WACC Review Final Determination, p. 414.
144 Application by Energex Limited (No 2) [2010] ACompT 7 (13 October 2010), Paragraph 91.
145 AER Rate of Return Guideline, Explanatory Statement, p. 159.
146 For completeness, this technique would produce an "estimate" of Stephen Fleming, who captained New Zealand between 1997 and 2007, averaging 32.4 at a strike rate of 71.5.

	AER 2009 WACC Review	AER 2013 Guideline
Market definition	"the AER has adopted a conceptual framework that defines 'the market' as the domestic Australian capital market with foreign investors recognised to the extent they invest in that market."[147]	"we propose that the defined market is an Australian domestic market that recognises the presence of foreign investors to the extent they invest in the Australian market."[148]

290. The AER also concludes that its specification of a representative investor as being a weighted-average across all investors remains appropriate:

	AER 2009 WACC Review	AER 2013 Guideline
Representative investor	"a weighted average of all investors in the market (i.e. the 'representative investor')."[149] "the task is to determine the valuation of the 'representative investor', which is the weighted average valuation of all investors in the market."[150]	"the representative investor [i]s the weighted average of investors within the defined market, where the weightings reflect market participation (equity ownership value) and risk aversion."[151]

291. In its 2009 WACC Review, the AER concluded that the relevant regulatory task was to take a weighted-average of the value that each investor applied to distributed credits. In its recent Guideline, the AER has removed any reference of value to investors:

	AER 2009 WACC Review	AER 2013 Guideline
Regulatory task	"the value of imputation credits is best considered a weighted average valuation of all investors (both domestic and foreign investors) in the defined market."[152]	"The value of imputation credits is calculated as a weighted average across investors in the defined market."[153]

292. In its 2009 WACC Review, the AER defined theta in the standard way to be the value of a distributed credit. In its recent Guideline, the AER has defined theta to be the average redemption rate – the amount of distributed credits that end up being redeemed:

	AER 2009 WACC Review	AER 2013 Guideline
Definition of theta	"θ (theta) is the per dollar value of a distributed credit."[154]	"The utilisation rate is the before-personal-tax reduction in company tax per one dollar of imputation credits that the representative investor receives." [155] "…the utilisation rate, which is the extent to which investors can use the imputation credits they receive to reduce their personal tax."[156]

[147] AER 2009 WACC Review Final Determination, pp. 425-426.
[148] AER Rate of Return Guideline, Explanatory Statement, p. 161.
[149] AER 2009 WACC Review Final Determination, p. 423.
[150] AER 2009 WACC Review Final Determination, p. 425.
[151] AER Rate of Return Guideline, Explanatory Statement, p. 142.
[152] AER 2009 WACC Review Final Determination, pp. 425-426.
[153] AER Rate of Return Guideline, Explanatory Statement, p. 161.
[154] AER 2009 WACC Review Final Determination, p. 414.
[155] AER Rate of Return Guideline, Explanatory Statement, p. 165.
[156] AER Rate of Return Guideline, Explanatory Statement, p. 159.

Reasons for the Guideline's re-definition of theta

293. The Guideline materials provide several reasons why it has changed its interpretation of theta from "the per dollar value of a distributed credit"[157] to "the extent to which investors can use the imputation credits they receive."[158] In this section, we evaluate each of the reasons that have been put forward in the Guideline materials.

Interpretation of the recent AEMC Rule change

294. The Guideline materials note that prior to the latest change the Rules stated that:

> γ is the assumed utilisation of imputation credits.[159]

295. At the time of the latest Rule change, all regulators (including the AER) had always interpreted this provision to require an estimate of the *value* of imputation credits, where "value" was interpreted as "value to the market". In this context, the AEMC amended the Rules to state that:

> γ is the value of imputation credits.[160]

296. In our view, the clear intention of the AEMC was to clarify that the prevailing regulatory practice (and the practice that is still adopted by all regulators other than the AER) should be continued. That practice is to estimate the *value* (as in "worth") of imputation credits. It seems highly unlikely that the AEMC could have had any other intention given that the wording in the new Rule accords precisely with the standard practice of all regulators at the time the Rule change was made.

297. Moreover, there are two reasons why it would seem to be quite fanciful to suggest that the intention of the AEMC was to *change* the interpretation of gamma *away* from the standard practice of all regulators at the time:

    a) The AEMC inserted the word "value," the ordinary meaning of which corresponds precisely to the practice of all regulators at the time of the change; and

    b) The AEMC did not provide a detailed explanation about why such as change was necessary in its Final Determination. This is consistent with a mere tidying up of a Rule to properly reflect the existing practice, but inconsistent with an intention to fundamentally change the Rules away from the adopted practice.

298. By contrast, the Guideline materials now conclude that the Rule which states that "gamma is the value of imputation credits" should not be interpreted as affirming the existing regulatory practice. In particular, the Guideline materials now contend that the term "value" in the Rules should not be interpreted as taking its common meaning of "worth" or "price," but rather as "the number used"[161] where the "number used" is determined on the basis of utilisation/redemption rates.

299. In our view, this is clearly inconsistent with the apparent intention of the AEMC given the context of the Rule change set out above. Moreover, if the AEMC had really intended "value" to mean "the

[157] AER 2009 WACC Review Final Determination, p. 414.
[158] AER Rate of Return Guideline, Explanatory Statement, p. 159.
[159] NER cls. 6.5.3, 6A.6.4 (as at version 52).
[160] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).
[161] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 150.

number used" it would surely have stated that γ is the value *for* imputation credits rather than the value *of* imputation credits.[162]

300. In summary, our view is that the AEMC Rule change does not support the new conceptual definition that is set out in the Guideline. Rather the change appears to be a mere tidying up of a Rule to properly reflect the longstanding regulatory practice.

McKenzie and Partington (2011)

301. The Guideline materials also refer to advice from McKenzie and Partington (2011) as supporting the new interpretation of theta. In its Guideline materials, the AER states that the McKenzie and Partington report that it commissioned during the *Gamma* case "raised fundamental questions over the framework."[163]

302. In that report, McKenzie and Partington (2011) state that there are two possible interpretations of theta:

> the market value of franking credits distributed[164]

and:

> the franking credits redeemed as a percentage of franking credits distributed…known as the utilisation ratio.[165]

303. That is, McKenzie and Partington (2011) are clear about the fact that one must choose between a *value* interpretation and a *utilisation* interpretation. In our view, it is this exact distinction that the AEMC sought to clarify in its Rule change. The standard regulatory practice has always been to estimate the *value* of imputation credits and this remains the practice of all regulators other than the AER. The Rule change clarifies that the *value* interpretation that has always been used is the correct one.

304. McKenzie and Partington (2011) are also clear about the fact that:

   a) Empirical studies such as dividend drop-off analysis provide an estimate of the *value* of imputation credits; whereas

   b) Redemption rates provide an estimate of the *utilisation* of credits.[166]

305. Nowhere in their report do McKenzie and Partington (2011) state their view about which of the value or utilisation interpretations is the appropriate one in the regulatory/valuation setting, although they do note that the general consensus is that the value interpretation should be used:

> The literature subsequent to Officer has tended to view both gamma and theta as market values.[167]

[162] NER cls. 6.5.3, 6A.6.4 (current since version 53); NGR r. 87A(1) (current since version 14).
[163] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 149.
[164] McKenzie and Partington (2011), p. 2.
[165] McKenzie and Partington (2011), p. 2.
[166] McKenzie and Partington (2011), p. 2.
[167] McKenzie and Partington (2011), p. 3.

306. In a more recent report, McKenzie and Partington (2013) clarify their view as follows:

> Theta (θ) is the value to the investor of the imputation credits distributed, expressed as a fraction of face value,[168]

and:

> The standard practice has been to measure the market value of theta.[169]

307. McKenzie and Partington (2013) then state that:

> The question then is how to measure the market value of the imputation credits[170]

and the balance of their report considers various empirical estimates of the value of imputation credits, without any further discussion of utilisation/redemption rates.

308. In summary, the advice from McKenzie and Partington does not recommend that the utilisation/redemption interpretation of theta should be adopted. Rather, McKenzie and Partington simply state that if such an interpretation *is* to be adopted, redemption rates provide an estimate of the *utilisation* of credits. Certainly McKenzie and Partington never suggest that when estimating theta redemption rates should be used to the exclusion of market value estimates, or even in preference to market value estimates.

309. In our view, the advice from McKenzie and Partington (2011, 2013) does not support the Guideline's reliance on redemption rates to estimate theta.

Handley (2008)

310. During its 2009 WACC Review, Handley (2008) provided the same advice in a report commissioned by the AER. One issue that was addressed in the Handley report was the appropriate interpretation of the utilisation/redemption rate estimates reported by Handley and Maheswaran (2006). Handley (2008) advised the AER that the Handley and Maheswaran study estimated utilisation/redemption rates, rather than the value of distributed credits. Handley further advised that it would be inappropriate to use a utilisation/redemption rate interpretation of theta for the purposes of estimating gamma. He advised the AER that a utilisation/redemption rate estimate of theta will not produce an appropriate estimate of gamma – at best, it will produce an upper bound for gamma.

311. In particular, Handley (2008) advised the AER that an estimate of gamma based on the utilisation/redemption rate interpretation:

> may be interpreted as a reasonable upper bound on the value of gamma.[171]

312. At the Roundtable convened by the AER in October 2008, Handley further addressed the concept of an estimate of gamma that was based on a utilisation/redemption rate (rather than on a market value

[168] McKenzie and Partington (2013), p. 31.
[169] McKenzie and Partington (2013), p. 32.
[170] McKenzie and Partington (2013), p. 33.
[171] Handley (2008), p.8.

estimate of theta). He again stated clearly that the utilisation/redemption rate interpretation does not provide an appropriate estimate of gamma:

> Well, that's not our estimate of gamma therefore we haven't said that's our estimate of gamma. In some ways, what you could do is you could certainly say that is perhaps an upper bound for what gamma is.[172]

313. In summary, the author of the main utilisation/redemption rate study that the AER relied upon at its last WACC Review has advised the AER that the study estimates the utilisation/redemption rate and not theta, and that utilisation/redemption rates cannot be used to provide an appropriate estimate of gamma. Handley's point is that his redemption rate study provides a reasonable estimate of the utilisation of imputation credits, but that the utilisation of credits cannot be used to produce an appropriate estimate of gamma.

314. In our view, the advice from Handley (2008) does not support the Guideline's primary reliance on redemption rates to estimate theta.

Officer (1994)

315. In its Guideline materials, the AER points out that Officer (1994) defines gamma to be both:

   a) The value of a dollar of tax credit to the shareholder; and

   b) The proportion of company tax that is rebated against personal tax.[173]

316. In their report for the AER, McKenzie and Partington (2011) also note this apparent inconsistency, describing it as "a potential source of confusion" [174] and "ambiguity."[175]

317. Logically, there are two paths through the confusion and ambiguity caused by the drafting of the text in Officer (1994):

   a) Conclude that 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) Conclude that Officer means gamma to have a *utilisation* interpretation and that words suggesting a *value* interpretation were poorly drafted.

318. In our view, the first interpretation is plausible and the second is not. To see this, first consider the following passage from Officer (1994):

> Where there is a market for tax credits one could use the market price to estimate the value of γ for the marginal shareholder, i.e. the shareholder who implicitly sets the price of the shares and the price of γ and the company's cost of capital at the margin, but where there is only a covert market, estimates can only be made through dividend drop-off rates.[176]

[172] AER Roundtable transcript, 10 October 2008, p. 18.
[173] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 138.
[174] McKenzie and Partington (2011), p.2.
[175] McKenzie and Partington (2011), p.3.
[176] Officer (1994), p. 5.

319. In our view, it is inconceivable that anyone who so clearly refers to the "market price" and "value" and who specifically references dividend drop-off analysis could possibly be of the view that the value interpretation was the one that was incorrect. Such explicit statements are unlikely to have been made by accident. It is far more likely that the references to "the proportion of tax collected from the company which gives rise to the tax credit associated"[177] have simply been poorly drafted.

320. Second, one can bypass the ambiguous language in Officer (1994) altogether and go directly to the mathematical equations and numerical examples to see precisely how gamma *is* interpreted in his paper. For example, consider the calculations in Officer's worked example. In particular, consider the calculations relating to the vanilla definition of WACC labelled "III" on p. 17 of Officer (1994). That example adopts the parameters set out in Table 1 below.

Table 1
Parameters for Officer (1994) worked example

Parameter	Symbol	Estimate
Corporate tax rate	T	39%
Gamma	γ	0.5
Cost of equity	r_e	17.70%
Cost of debt	r_d	14.32%

Source: Officer (1994)

321. The cash flows and imputation credits from that example are summarised in Table 2 below.

Table 2
Cash flows and imputation credits for Officer (1994) worked example

	Symbol	$ (millions)
Pre-tax profit	X_O	39.96
Interest	X_D	5.14
Taxable income	X_O-X_D	34.82
Corporate tax	TAX	13.58
Face value of imputation credits	IC	13.58

Source: Officer (1994)

322. In general, the annual cash flow to equity is:

$$\begin{matrix} Cash\ Flow \\ to\ Equity \end{matrix} = \begin{matrix} Pre-tax \\ Profit \end{matrix} - Interest - \begin{matrix} Corporate \\ Tax \end{matrix} + \begin{matrix} Value\ of \\ Imputation\ Credits \end{matrix}$$

which can be expressed as:

$$CF(Equity) = X_O - X_D - TAX + \gamma \times IC.$$

323. Consequently, the annual cash flow to equity in this case is:[178]

177 Officer (1994), p. 5.

178 Since, in this example, all of the profits after interest and tax are paid as a dividend to the shareholders, we can also write $CF(Equity) = Dividend + \gamma \times IC = 21.24 + 0.5 \times 13.58 = 28.03$.

$$\begin{aligned} CF(Equity) &= X_O - X_D - TAX + \gamma \times IC \\ &= 39.96 - 5.14 - 13.58 + 0.5 \times 13.58 \\ &= 28.03. \end{aligned}$$

324. Since, in this example, all cash flows are perpetuities the value of equity is given by: [179]

$$E = \frac{X_O - X_D - TAX + \gamma \times IC}{r_e} = \frac{39.96 - 5.14 - 13.58 + 0.5 \times 13.5}{0.177} = 158.362\,.$$

325. This expression unambiguously shows that gamma represents the extent to which imputation credits are capitalised into the stock price. Gamma shows the effect that imputation credits have on the *value* of the shares. In the absence of imputation credits, the value of the firm's equity would be:

$$E_{ex-IC} = \frac{X_O - X_D - TAX}{r_e}.$$

326. Gamma then represents the increase in the *value* of equity due to imputation credits, expressed as a proportion of the face value of imputation credits:

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

327. This shows, unambiguously, that gamma has a *value* interpretation.

328. Finally, we note that McKenzie and Partington (2011) have advised the AER that:

> The literature subsequent to Officer has tended to view both gamma and theta as market values.[180]

329. We suggest that the foregoing discussion explains why it is that the standard practice is to view gamma and theta as market values. We also suggest that the literature subsequent to Officer has *uniformly* viewed gamma and theta as market values. Even the authors of utilisation/redemption rate studies view gamma and theta as market values, such that redemption rates can only provide an upper bound.

330. In our view, Officer (1994), properly and holistically interpreted, does not support the Guideline's reliance on redemption rates to estimate theta.

Hathaway and Officer (2004)

331. The Guideline materials present a quote from Hathaway and Officer (2004) that is claimed to be "supporting the cash flow interpretation of the value of imputation credits."[181] However, the Guideline materials have misconstrued the point that Hathaway and Officer are making. The point

[179] Similarly the value of debt is given by $D = \frac{5.14}{0.14316} = 35.903$ in which case the value of the firm is $V = E + D = 194.265$ as set out in Officer (1994, p. 17).
[180] McKenzie and Partington (2011), p. 3.
[181] AER, Rate of Return Guideline, Explanatory Statement, Appendix H, p. 143, emphasis added.

being made is simply that estimates of the value of distributed credits are not estimates of gamma, but of theta. They need to be multiplied by the distribution rate (*F*) to obtain an estimate of gamma.

332. Indeed the Guideline materials quote only the first half of the relevant paragraph. In the second half of that same paragraph, Hathaway and Officer (2004) state that:

> Gamma is not the *value* of distributed credits alone. It is the compounding of two factors – the fraction of tax distributed as credits multiplied by the *value* of distributed credits. In this sense it is the *value* of all possible credits, that is, the *value* of all tax payments giving rise to the creation of credits.[182]

333. Moreover, the primary purpose of the Hathaway and Officer (2004) study was to present the results of a dividend drop-off analysis, which is clearly relevant only to the standard *value* interpretation of theta. Hathaway and Officer also present some statistics relating to redemption rates, but that analysis has been retracted by Hathaway who has since stated that it should not be relied upon.[183]

334. In our view, Hathaway and Officer (2004) does not support the Guideline's reliance on redemption rates to estimate theta.

Lally (2013a)

335. In his report for the AER, Lally (2013a) considers a theoretical framework in which, under certain assumptions, the weighted-average utilisation rate will equal the equilibrium value of distributed imputation credits. Under this set of assumptions, theta can be estimated either by estimating the weighted-average utilisation rate or by using market value studies to estimate the effect that imputation credits have on stock prices – because the market value must be equal to the weighted-average utilisation rate under those special assumptions.

336. Lally (2013a) recommends to the AER that they adopt a set of assumptions whereby all Australian equities are owned by resident investors who fully redeem all imputation credits that are distributed to them and who value a redeemed imputation credit equal to a dollar of cash dividends. Under these special assumptions, theta will be equal to the weighted-average utilisation rate, which is 100%. Thus, Lally recommends that the AER should set theta equal to 1.

337. The AER has rejected that advice on the basis that the special assumptions that are required to support it are clearly violated in practice.[184] In particular, Australian equities are not owned entirely by resident investors. Indeed, the estimates of all other WACC parameters reflect the effect of foreign investors, so the estimate of theta should also reflect the effect of foreign investors.

338. This leads the AER to depart from the set of assumptions under which theta will be equal to the weighted-average utilisation rate. That is, the Guideline adopts a framework in which the pre-conditions for that result do not hold. Yet the Guideline continues to estimate theta as the weighted-average utilisation rate even though it departs from the assumptions that are required for that result to hold.

339. This position is supported by quoting various passages from Lally (2013a). However, those passages from Lally (2013a) indicate that theta will be equal to the weighted-average utilisation rate *only under certain assumptions*, which are departed from in the Guideline framework. Indeed, Lally is critical of the

[182] Hathaway and Officer (2004), p. 7.
[183] Hathaway (2013), Paragraph 12.
[184] AER Rate of Return Guideline, Explanatory Statement, p. 178.

AER for continuing to estimate theta as the weighted-average utilisation rate even though it departs from the assumptions that are required for that result to hold.

340. The Lally (2013a) advice to the AER on this issue is identical to the submission from the ENA (2013). However, the AER's Guideline materials do not reference the ENA submission on this issue and they interpret Lally (2013a) as actually endorsing the approach that is proposed in the Guideline. Consequently we devote a separate appendix of this report to an explanation of this important issue, below.

Summary and conclusions

341. On the issue of the conceptual definition of theta, we conclude that:

a) The Guideline is alone in its conceptual interpretation of theta:

i) Prior to the current Guideline, the practice of all regulators was to interpret theta[185] as the value (to the market) of distributed imputation credits;

ii) This remains the practice of all other regulators;

iii) The Guideline now proposes to refer to theta as "the utilisation rate" and to conceptualise it as "the extent to which investors can use the imputation credits they receive to reduce their personal tax"[186];

b) None of the proposed reasons for the conceptual redefinition of theta that are set out in the Guideline materials are valid, or supported by advice or evidence:

i) The AEMC Rule change (which now specifically defines gamma to be "the value of imputation credits") does not support the 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 Rule change is quite inconsistent with the notion that the longstanding *value* interpretation should be replaced by a different interpretation;

ii) McKenzie and Partington (2011) identify two possible interpretations for theta – the standard value interpretation and the Guideline's utilisation interpretation. They express no opinion about which interpretation is correct or which should be preferred. However they do note that the "standard practice has been to measure the market value of theta"[187] and in a subsequent report they have stated that "theta is the value to the investor of the imputation credits distributed;"[188]

iii) Handley (2008) has advised the AER that his redemption rate study provides a reasonable estimate of the utilisation of imputation credits, but that the utilisation of credits cannot be used to produce an appropriate estimate of gamma. Handley advises that since theta represents the value (to the market) of imputation credits, and since redemption rates provide only an upper bound for that value, they can only be used to produce an upper bound and not a point estimate;

[185] Or whatever term is used for "the parameter that must be multiplied by *F* to obtain gamma."
[186] AER Rate of Return Guideline, Explanatory Statement, p. 159.
[187] McKenzie and Partington (2013), p. 32.
[188] McKenzie and Partington (2013), p. 31.

iv) Officer (1994) refers to theta in terms of both value to shareholders and utilisation. However, the formulas and numerical calculations show, unambiguously, that gamma has a *value* interpretation whereby gamma represents the increase in the *value* of equity due to imputation credits, expressed as a proportion of the face value of imputation credits;

v) The Guideline materials cite part of a paragraph of Hathaway and Officer (2004) as supporting its proposed interpretation of theta. However, the Guideline materials misconstrue the point that was being made, which is simply that gamma is the product of the distribution rate and theta. The remainder of the same paragraph endorses the standard value interpretation of theta: "Gamma is not the value of distributed credits alone. It is the compounding of two factors – the fraction of tax distributed as credits multiplied by the *value of distributed credits*."[189]; and

c) Lally (2013a) advises the AER that theta can be estimated as the weighted-average utilisation rate *only under certain assumptions*, which do not hold in the Guideline's framework. Lally is critical of the AER for continuing to estimate theta as the weighted-average utilisation rate even though it departs from the assumptions that are required for that result to hold.

[189] Hathaway and Officer (2004), p. 7.

Appendix 6: The advice from Lally (2013)

Theoretical framework

342. Lally (2013a) considers a class of models that includes Monkhouse (1993) and Lally and van Zijl (2003). These models all consider a setting in which there is a single market in which the *m* investors jointly own all of the *n* assets. In these models there is a closed system – there are no assets outside the market that are available to the *m* investors inside the market and there are no investors outside the market who can buy any of the *n* assets inside the market. That is, these models only apply in a closed system where the *m* investors collectively own all of the *n* assets and nothing else.

343. 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.

344. 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.

345. 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.

346. A by-product of these equilibrium calculations is an estimate of the equilibrium value of the imputation credits that are distributed by each firm. This is a derived figure for the extent to which imputation credits will be capitalised into the equilibrium stock price. In these models, the equilibrium value of imputation credits (capitalised into the stock price) turns out to be a weighted-average of the extent to which each investor is able to redeem imputation credits, weighted by wealth and risk aversion. That is, under the assumptions of these models (including the assumption that a dollar of redeemed credit is equal in value to a dollar of cash dividends) the market value of imputation credits (i.e., the extent to which the credits are capitalised into stock prices) will be equal to the weighted-average redemption rate. Under the assumptions of these models, the market value of imputation credits can be estimated as the weighted-average of the utilisation rates of the *m* investors.

347. That is, in an economy where the prerequisite conditions hold (i.e, there is a closed system in which the *m* investors collectively own all of the *n* assets and nothing else) and where all of the assumptions of the model hold (including the assumption that redeemed credits and cash dividends are equally valued), it must be the case that the market value of imputation credits is equal to the weighted-average utilisation rate. In this case, there is equality between:

    a) The extent to which imputation credits are capitalised into stock prices; and

    b) The weighted-average redemption rate.

That is, there are two equivalent ways of determining the value of imputation credits, but only if the pre-requisite conditions and assumptions of the model hold.

Specific cases of a closed system

348. Lally (2013a) considers an extreme case where:

a) There are *m* investors who collectively own all of the *n* assets and nothing else;

b) All of the *m* investors value a dollar of redeemed credits equal to a dollar of cash dividends, and

c) All of the *m* investors can redeem 100% of the imputation credits that are distributed to them (i.e., there are no foreign investors).

349. He notes that (a) and (b) above establish the pre-conditions that are required for theta to be equal to the weighted-average utilisation rate. He also notes that from (c) above the weighted-average utilisation rate will be 100%. In this special case, 100% of the face value of the distributed credits will be capitalised into the stock price and theta will be equal to 1. Lally (2013a) recommends that the AER should adopt the assumptions set out above and set theta to 1.

350. Of course, if theta is to be estimated not as it actually *is* in the market for equity funds, but as it *would be* in a world with no foreign investors, consistency requires that all WACC parameters must be estimated on the same basis. Lally (2013a) presents some calculations to show how one might go about estimating beta and MRP as they *would be* in such a world.

351. Lally (2013a) also considers the case of perfectly integrated capital markets where:

a) The *m* investors consist of all global investors; and

b) The *n* assets consist of all global equities.

352. This is also a closed system in which the *m* investors collectively own all of the *n* assets and nothing else. Consequently, an equilibrium exists in which the value of imputation credits capitalised into the stock price is equal to the weighted-average of the utilisation rates over the *m* investors. In this case, only a small proportion of the *m* investors are eligible to redeem imputation credits (commensurate with the small proportion of Australian investors in the global market), in which case theta will be negligibly small.

353. By contrast, the Guideline proposes a setting in which:

a) The *m* investors consist of all Australian investors and those foreign investors who own some Australian shares; and

b) The *n* assets consist of all Australian equities.

354. This is not a closed system because it is not the case that the *m* investors collectively own all of the *n* assets and nothing else. Consequently, no market clearing equilibrium can be derived and it will not be the case that an equilibrium exists in which the value of imputation credits capitalised into the stock price is equal to the weighted-average of the utilisation rates over the *m* investors.

355. In the context of these equilibrium models, if foreign investors are included, foreign assets must also be included. Alternatively, if foreign assets are not included, then foreign investors must be assumed away. If neither of these assumptions is made, no equilibrium model will apply and the weighted-average utilisation rate cannot be used as an estimate of theta.

356. By way of analogy, consider two children's birthday parties being held side by side in a park. The objective is to determine whether the food has been fairly distributed among the children (having regard to their different ages and taste preferences etc.). If each child is only allowed to take food from their party's table, fairness can be assessed by observing what each child takes relative to the total food available from that table. That is, each table is a closed system. If, however, children are allowed to take food from either table, fairness can only be assessed by observing the total amount of food taken by each child relative to the total amount of food available from both tables. That is, there is a single closed system consisting of all of the food and all of the children.

357. Note that, in the latter case, it is impossible to determine anything by observing only the food that each child takes from one of the tables because there is no information about whether that child has taken a little or a lot from the other table. In this case, a single table is not a closed system, so we can infer nothing from observing just that table. The only setting in which one can infer anything from observing a single table is in the former case where there are no "foreign investors" at all.

358. In the case where the prerequisite conditions for the model do not hold, the weighted-average redemption rate will not tell us anything about the equilibrium value of imputation credits (in the same way that observing how much food each child takes from one table will tell us nothing about whether or not each child has a fair proportion of the food overall). In this case, the weighted-average redemption rate cannot be used to estimate the value of imputation credits, leaving empirical estimation from observed stock prices as the only available method.

Lally's advice to the AER on the application of equilibrium models

359. Lally (2013a) 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.

360. 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. This approach remains in the Guideline even after Lally (2013a) 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.

Lally's "endorsement" of the AER approach

361. The AER engaged Lally (2013a) to undertake a critical review of the imputation credit related sections of the draft Guideline and concludes that the Lally review supports its theta estimate of 0.7:

> The expert advice from Associate Professor Lally suggests that our determination of a utilisation rate of 0.7 is reasonable, based on the evidence currently available.[190]

[190] AER Rate of Return Guideline, Explanatory Statement, p. 170.

362. However, what Lally (2013a) actually concludes is that theta should be set to 1 by "ignoring foreigners."[191] That is, Lally recommends that we should *assume* that all Australian equities are owned entirely by Australian residents who can fully utilise imputation credits, despite clear evidence to the contrary.

363. Associate Professor Lally has recommended this approach to Australian regulators for at least 10 years[192] and none of them have ever adopted it.

364. Lally (2013a) goes on to consider other approaches for estimating theta. He ranks each of the other approaches in terms of how close they are to his favoured "ignoring foreigners" estimate of 1. The Guideline's estimate of 0.7 ranks second because it is closest to Lally's favoured estimate of 1.

365. Indeed Lally concludes that the Guideline's approach produces estimates that are implausible,[193] as do all approaches other than his "ignoring foreigners" approach.

366. Lally (2013a) goes on to state that the only redeeming feature of the Guideline's equity ownership approach is that, even though it is an estimate of the wrong thing, it is at least a statistically precise one.[194] However even that is disputed in Appendix 8 below.

367. In the remainder of this appendix, we review each of the criticisms of the Guideline approach that are set out by Lally (2013a).

Inconsistency of Guideline approach

368. As set out above, Lally's main criticism of the Guideline's proposed approach is that it applies the result of a model (theta is equal to the weighted-average utilisation rate) where the pre-conditions for that result (a closed system) do not apply.[195] He clearly advises that the theoretical result (theta is equal to the weighted-average utilisation rate) will only apply where the pre-conditions for the model are satisfied, namely either:

    a) A perfectly segmented market in which all Australian equities are owned by Australian investors, who own nothing else; or

    b) A perfectly integrated market that includes all global equities and all global investors.

369. The Guideline's proposed framework is neither of these cases, so the theoretical result (theta is equal to the weighted-average utilisation rate) does not apply. The Guideline considers a more realistic case in which Australian investors own some foreign assets and foreign investors own some Australian assets, as that would be commensurate with the market for equity funds. But Lally notes that equilibrium results can only be obtained if we assume that markets are perfectly segmented, in which case:

> foreign investors, who by definition can hold both Australian and foreign risky assets, have no place in such a model[196]

or if we assume that markets are perfectly integrated, in which case:

[191] Lally (2013a), p. 3.
[192] See, for example, Lally (2004).
[193] Lally (2013a), p. 4.
[194] Lally (2013a), pp. 3-4.
[195] Lally (2013a), p. 14.
[196] Lally (2013a), p. 14.

> if Australian investors have access to foreign assets, the appropriate CAPM will reflect that fact and the equilibrium prices of Australian assets will differ. [197]

370. Lally (2013a) also notes that:

> The ENA (2013, section 7.4.6) makes the same point

and we include the relevant section of that submission as Appendix 7 to this report.

371. Lally (2013a) comments further on the inconsistency of using a theoretical result in a setting where the pre-conditions for that theoretical result are not satisfied. He says 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. 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 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, in which case the relevant investors are those throughout the world and the relevant market portfolio would be all risky assets throughout the world.[198]

372. Copeland (2014) also 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.[199]

Circularity of Guideline approach

373. Lally (2013a) also concludes that the "equity ownership" approach has no proper basis:

> 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.[200]

374. Here, Lally is referring to the AER's Draft Explanatory Statement, which simply defines that theta is equal to the redemption rate:

[197] Lally (2013a), p. 14.
[198] Lally (2013a), pp. 14-15.
[199] Copeland (2014), p. 5.
[200] Lally (2013a), p. 13.

> The utilisation rate is the proportion of distributed credits that investors redeem to reduce their tax liabilities.[201]

375. Lally's point here can be summarised as follows:

   a) A number of different methods have been proposed for estimating theta;

   b) One of the methods that has been proposed is the imputation credit redemption rate, which can be estimated either:

      i) By using ATO redemption data; or

      ii) By estimating the proportion of Australian equities that are owned by residents, and assuming that residents will redeem all credits that are distributed to them;

   c) The Guideline defines that theta is equal to the redemption rate; and

   d) The Guideline then gives primary weight to its redemption rate estimates of theta on the basis that they "accord with the AER's interpretation" of theta.[202]

376. That is, Lally's point is one of basic logic – the Guideline's approach is entirely circular in the way that it defines theta in terms of one of the estimation methods and then concludes that estimation method must receive most weight because it best accords with the Guideline's definition.

377. We agree with Lally's criticism of the circularity of this approach and with his conclusion that the Guideline approach is "not correct" in the way that it defines theta (or the "utilisation rate.")

378. This criticism of the proposed approach is not addressed anywhere in the Guideline. Rather, the Guideline materials conclude that Lally actually supports the proposed approach:

> In his review, Lally considers that this estimation technique aligns with our conceptual framework.[203]

379. Of course the AER's favoured estimation technique aligns with their conceptual framework. Lally's whole point is that the AER's conceptual framework is simply to define theta in terms of the favoured estimation technique. The fact that that estimation technique then aligns with the conceptual framework is entirely circular.

380. Lally (2013a) is very clear about this point when he points out that the equity ownership approach for estimating theta:

> follows directly from the AER's definition of *U*.[204]

Guideline approach has "perverse" effects

381. Lally (2013a) also notes that the Guideline's equity ownership approach:

201 AER Draft Rate of Return Guideline, Explanatory Statement, p. 237.
202 AER Rate of Return Guideline, p. 24.
203 AER Rate of Return Guideline, Explanatory Statement, p. 172.
204 Lally (2013a), p. 16.

> has a potentially perverse effect upon the estimated cost of equity. In particular, as national equity markets become increasingly integrated, foreign ownership of Australian equities will rise, and any estimate of U that is consistent with its definition will fall. If this has the effect of raising the estimated cost of equity capital using the Officer model and the true cost of equity actually falls as markets become more integrated (because investors will be holding more well diversified portfolios) then the effect of defining U to include foreign investors will be entirely perverse.[205]

382. That is, as barriers to foreign investment fall, the supply of foreign equity capital will tend to rise, having the effect of reducing the cost of equity for Australian firms (a simple supply/demand effect). This will also result in a fall in the equity ownership estimate of theta, and a consequential increase in the regulatory estimate of the allowed return on equity, which Lally correctly describes as "entirely perverse."

383. Indeed the equity ownership approach implies that Qantas (and all Australian firms) should be arguing for a *tightening* of foreign ownership restrictions as this would increase the proportion of resident ownership and consequently reduce the required return on equity, which is also entirely perverse.

Summary of advice from Lally (2013a)

384. The key points to be drawn from the Lally (2013a) discussion of the conceptual framework for theta are as follows:

   a) Lally has advised that under certain special conditions and assumptions, theta will equal the weighted-average utilisation rate. And when those conditions and assumptions do not hold, theta will not equal the weighted-average utilisation rate;

   b) The Guideline proposes to estimate theta as the weighted-average utilisation rate in a setting where those special conditions and assumptions do not hold – the real-world Australian equity market, which has been "contaminated" by foreign investment. Lally advises that it is wrong to apply a theoretical result in a setting where the pre-conditions for that theoretical result are not satisfied;

   c) Lally advises that the Guideline's approach is circular and "not correct" in the way that it defines theta in terms of one of the estimation methods and then concludes that estimation method must receive most weight because it best accords with its own definition;

   d) Lally advises that the application of the Guideline approach produces results that are "entirely perverse." As barriers to foreign investment fall, the supply of foreign equity capital will tend to rise, having the effect of *reducing* the cost of equity for Australian firms. This will also result in a fall in the equity ownership estimate of theta, and a consequential *increase* in the allowed return on equity.

[205] Lally (2013a), pp. 15-16.

Appendix 7: ENA submission cited by Lally (2013)

385. The Explanatory Statement cites a number of studies that derive representative investor models in the context of a dividend imputation tax system. Those studies include Lally (1992), Lally and van Zijl (2003), and Monkhouse (1993). Those papers are all based on the basic CAPM framework and/or the after-tax CAPM framework that was originally developed by Brennan (1970).[206]

386. In the 2009 WACC Review, the discussion of representative investor models converged on a setting in which there is a single market consisting of *n* risky assets held collectively by *m* investors. The AER stated that:

> …the starting point for the Sharpe CAPM (and all subsequent versions of the CAPM) is to assume a given set of assets (n risky assets and a risk-free asset) and a given set of investors (m) who collectively determine the prices of those assets.[207]

387. In his advice to the AER on this issue, Handley (2009) also set out part of the derivation of the CAPM where there is a single market consisting of *n* risky assets held collectively by *m* investors.[208]

388. A crucial aspect of these models is that:

    a) The *m* investors must, between them, hold 100% of the *n* assets; and

    b) The *m* investors own nothing other than the *n* assets.

389. That is:

    a) None of the *m* investors can hold any assets outside the model; and

    b) There can be no investors outside of the model who can possibly buy any of the *n* assets inside the model.

390. In other words, the derivation of the CAPM and subsequent models that are based on it, require a closed system. A model in which investors who are inside the system are able to invest in assets outside the system, or where investors outside the system are able to invest in assets inside the system is very different from the CAPM or any subsequent model based on it. None of the CAPM derivations hold in such a case and the CAPM pricing equation (which is used to estimate the required return on equity) does not hold.

391. To see this, consider the derivation presented by Brennan (2008)[209] as cited by Handley (2009).[210] Here every investor maximises their end-of-period utility:

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[206] Brennan, M.J., (1970), Taxes, Market Valuation and Corporate Financial Policy, National Tax Journal, 23, 417–427.
[207] AER 2009 WACC Review Final Decision, p. 424.
[208] Handley (2009), "Further comments on the valuation of imputation credits," pp. 13-14.
[209] Brennan, M.J., "Capital asset pricing model," in "The New Palgrave Dictionary of Economics," Eds. Steven N. Durlauf and Lawrence E. Blume, Palgrave Macmillan, 2008, The New Palgrave Dictionary of Economics Online, Palgrave Macmillan. 23 September 2013, DOI:10.1057/9780230226203.0190.
[210] Handley (2009), *Further comments on the value of imputation credits*, April, www.aer.gov.au. We adopt the full notation, as set out in Brennan (1992).

$$\underset{z_{ij}}{Max} V_i\left(\overline{W_i}, S_i^2\right)$$
$$\text{subject to :}$$
$$\overline{W_i} = \sum_{j=1}^{n} z_{ij}\overline{P}_{j1} - R\sum_{j=1}^{n}\left(z_{ij} - \overline{z}_{ij}\right)\overline{P}_{j0}$$
$$S_i^2 = \sum_{j=1}^{n}\sum_{k=1}^{n} z_{ij}z_{ik}\omega_{jk}$$

392. The first of these equations says that all investors maximise their end-of-period expected utility over their total portfolio. Utility is increasing in wealth (and hence expected returns), $\overline{W_i}$, and decreasing in variance, S_i^2. z_{ij} represents the weight that investor *i* invests in each of the *n* assets. The second equation says that investor *i* must invest all of his wealth among the assets within the market. Expected end-of-period wealth is the expected payoff on each of the *n* risky assets inside the system plus the return on the amount invested in the risk-free asset. The last equation is the expression for the variance of the returns of the investor's portfolio, all of which has been invested among the *n* assets inside the market.

393. Brennan (2008) goes on to note that market clearing requires that $\sum_{i=1}^{m}\mathbf{z_i} = \mathbf{1}$. This market clearing condition requires that, for each asset *j*, the sum of the demands of all investors must equal the supply of the asset.

394. The budget constraint above requires that every investor has invested 100% of their initial wealth allocation among the *n* risky assets (and the risk-free asset) in the market.

395. In summary, the derivation of the equilibrium requires that:

a) The *m* investors must, between them, hold 100% of the *n* assets in the market; and

b) The *m* investors own nothing other than the *n* assets (and a residual position in the risk-free asset).

396. That is:

a) None of the *m* investors can hold any assets outside the market; and

b) There can be no investors outside of the market who can possibly buy any of the *n* assets inside the market.

397. If these requirements for market clearing are not met, no equilibrium can be derived, no representative investor can be determined, and the CAPM pricing relation cannot be obtained.

398. Now consider the case where each of the *m* investors inside the system is able to invest in n_1 assets inside the system and n_2 assets outside the system, this optimisation becomes:

$$\underset{z_{ij}}{Max} V_i\left(\overline{W}_i, S_i^2\right)$$

subject to :

$$\overline{W}_i = \sum_{j=1}^{n_1+n_2} z_{ij}\overline{P}_{j1} - R\sum_{j=1}^{n_1+n_2}\left(z_{ij} - \overline{z}_{ij}\right)\overline{P}_{j0}$$

$$S_i^2 = \sum_{j=1}^{n_1+n_2}\sum_{k=1}^{n_1+n_2} z_{ij} z_{ik} \omega_{jk}.$$

399. That is, the end-of-period utility of each investor depends on the value of his investments inside the system plus the value of his investments outside the system and the relationship (covariance) between those two holdings. This optimisation has the obvious implication that investors in CAPM-type models maximise the utility of their total portfolios. When considering the return that they require from a particular investment, investors consider the returns that are available from alternative investments and the relationship between the particular investment and the rest of the investor's portfolio.

400. The ENA submits that (a) if the standard requirements for market clearing are not met, no equilibrium can be derived, no representative investor can be determined, and the CAPM pricing relation cannot be obtained, and (b) the standard market clearing conditions are not met in the "representative investor" framework set out in the Explanatory Statement.

Appendix 8: Implementation issues for alternative definitions of theta

Overview

401. This appendix examines implementation issues in relation to the equity ownership, tax statistic and conceptual goalposts approaches. The focus is on the quality of the available data and the reliability of the estimate. The issue of whether these approaches provide an estimate that is consistent with the appropriate definition of theta is addressed in the body of the report.

Reliability of equity ownership data

402. Implementation of the equity ownership approach is fraught with difficulty. This is best demonstrated by the facts that:

a) Lally (2012) concludes that "the proportion of Australian equities held by Australians" is 54%[211] whereas Lally (2013a) puts the figure at 70%[212] based on a data source that pre-dates the earlier estimate by four years; and

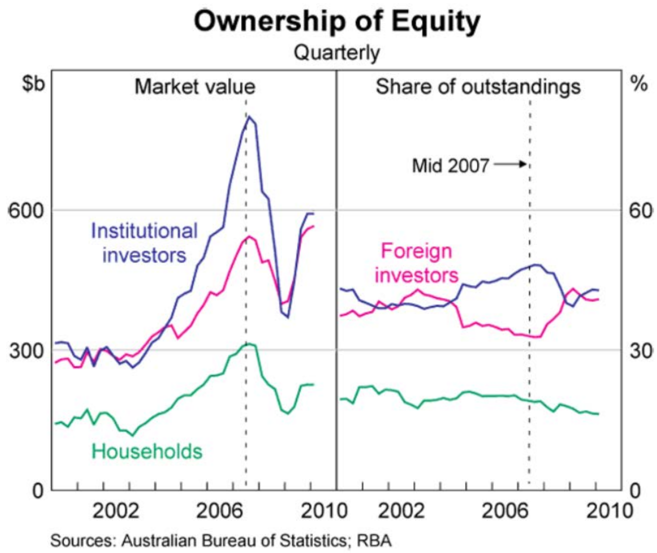
b) The Australian Bureau of Statistics has posted a data quality warning in relation to the data that has been relied upon by Lally (2103a) and the AER.[213]

Updated estimates of equity ownership

403. The AER and Lally (2013a) both refer to an estimate of "the proportion of Australian shares that are held by Australians" of 70%.[214] The original source of this figure is the AER Draft Guideline Explanatory Statement, which in turn refers to a 2007 estimate from the Australian Bureau of Statistics (**ABS**).[215] 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 – as illustrated in Figure 8 below.

[211] Lally (2012), p. 6.
[212] Lally (2013a), p. 16.
[213] See the ABS feature article that first explains the foreign ownership calculations at http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5306.0Feature%20Article150Jun%201992?opendocument&tabname=Summary&prodno=5306.0&issue=Jun%201992&num=&view=.
[214] See Lally (2013a), p. 16.
[215] AER Draft Guideline Explanatory Statement, Footnote 367, p. 130 cites the source of the 70% figure as being Australian Bureau of Statistics, *Feature article: Foreign ownership of equity*, Available at: http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5302.0Feature%20Article10Sep%202007?opendocument&tabname=Summary&prodno=5302.0&issue=Sep%202007&num=&view.

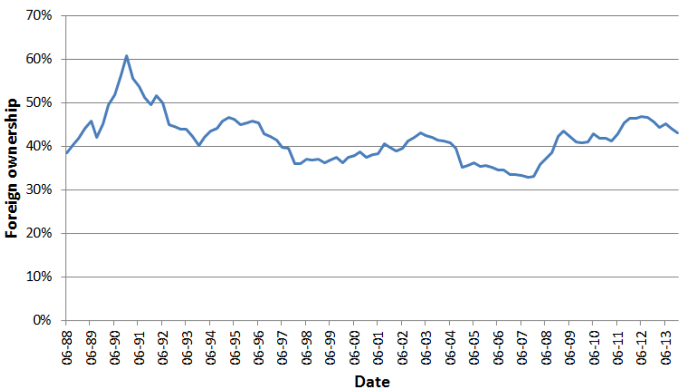
Figure 8
RBA estimates of the ownership of Australian equity



Source: Black and Kirkwood (2010), RBA.

404. If the ABS aggregate equity ownership estimate is to be used, the 2007 estimate should not be preferred to the updated estimates – which show materially higher levels of foreign investment. Figure 9 below shows the time series of foreign ownership percentages using the ABS data that was the source of the 30% estimate adopted in the Guideline and of Black and Kirkwood (2010). This figure shows that more recent estimates of foreign ownership are in the order of 45%.[216]

Figure 9
Updated ABS estimates of the ownership of Australian equity



Source: ABS Series 5232.0 Australian National Accounts: Financial Accounts, Table 32.

Consistency with ASX estimates

405. The updated estimates set out above are consistent with those reported by the Australian Securities Exchange (ASX). The ASX presents foreign ownership estimates for privately-owned equity only. Lally (2012) refers to the ASX (2011) estimate of 46% foreign ownership and concludes that "the

216 These figures are computed as ABS Series A3425417X divided by the sum of ABS Series A3366544F, A3364525L, A3364528V, A3545235F, A3372154L, A3367456X, A3545239R, A3358849V, A3359968C, A3361015J, A3545244J, A3545245K, and A3369589R.

proportion of Australian equities held by Australians" is 54%.[217] ASX (2013) provide the most recent estimate of the proportion of privately-owned equity that is owned by foreign investors, concluding that the best estimate remains at 46%.[218]

Lally (2012, 2013a, 2013b) estimates of redemption rates

406. In his recent reports for the QCA and AER, Lally provides a number of estimates of "the proportion of Australian equities owned by Australians." In his November (2012) report to the QCA, Lally (2012) states that:

> the proportion of Australian equities held by Australians is 54%.[219]

407. The source of this estimate is ASX (2012), which is based on data through to the end of 2011.

408. In his November 2013 report to the QCA, Lally (2013b) cites two estimates. Both of these pre-date the estimate he used in his earlier report and both of them are higher than the estimate he used in his earlier report. He provides no indication of why these superseded estimates should now be preferred to the more recent estimate used in his 2012 report. He simply refers to the task of estimating the proportion of Australian equities owned by Australians and states that:

> In respect of listed equity, this is currently about 60% (Black and Kirkwood, 2010, page 2). If unlisted equity were included, with valuations based upon accounting values, the result is (unsurprisingly) higher at about 70% (Australian Bureau of Statistics, 2007).[220]

409. Throughout the remainder of the latter report, Lally (2013b) states that the proportion of Australian equities held by Australians is "about 0.70"[221] without providing any indication of why that estimate should be preferred among the two (superseded) estimates that are cited.

410. In his November 2013 report to the AER, Lally (2013a) confirms that he has adopted the AER estimate that is based on the 2007 ABS data, without any reference to any other estimates:

> Drawing upon data from the Australian Bureau of Statistics (2007), the estimate is 70%.[222]

411. In summary, between his 2012 and 2013 reports, Lally has increased his equity ownership estimate materially by relying on data that is four years older and which includes approximations in relation to unlisted equity that is the subject of data quality warnings from the ABS – without any explanation or even any reference to his earlier estimate that was based on more current data.

Use of unlisted equity

412. The 45% foreign ownership figure in Figure 9 above is based on listed equity. In our view, this is the appropriate calculation given that all other WACC parameters are estimated with reference to exchange-listed businesses because they are more reflective of the efficient benchmark entity.

217 Lally (2012), p. 6.
218 ASX (2013), p. 2. The ASX figures are based on ABS series 5232.0, Table 32 for the September quarter 2012.
219 Lally (2012), p. 6.
220 Lally (2013b), p. 13.
221 Lally (2013b), pp. 3, 38, 53.
222 Lally (2013a), p. 16.

Consequently, the reference to calculations including unlisted equity above (Paragraph 408 above) is not relevant.

413. Moreover, the ABS warns that its estimates in relation to unlisted equity are unreliable. In particular, the ABS warns that:

> The estimated market value of equity issued by some sectors is considered to be of poor quality. In particular, estimates of the market value of the amount issued by private corporate trading enterprises are considered poor because they are largely built up from counterpart and other information obtained from ABS Surveys of Foreign Investment and Balance Sheet Information. This sector covers equity issued by both listed and unlisted private corporate trading enterprises, of which there are over half a million.
>
> In terms of the analysis undertaken here, errors in the estimated market value of equity on issue will impact on the accuracy of estimates of the proportion of that equity owned by non-residents.
>
> A further concern relates to valuation. While both financial accounts and international investment statistics (from which the rest of the world data are sourced) are on a market value basis in principle, collection and estimation methods differ between the two sets of statistics…Because of the differences in the methodologies used, it is possible that there could be more variability in the market value estimates of equity held by the rest of the world than in the estimated market value of the equity on issue, thus causing some variation in the foreign ownership series derived from these data.[223]

Reliability of ATO redemption rate data

414. The ATO maintains two separate databases that relate to imputation credits:

a) The ATO franking account balance (FAB) data; and

b) The ATO dividend flow data.

415. The FAB data is used when estimating the distribution rate, *F*. Companies record any undistributed credits in their franking account balance. Consequently, the estimation of the distribution rate over any particular period is a relatively straightforward calculation since:

a) The total amount of credits created is equal to the total amount of corporate tax collected; and

b) The total amount of credits that are not distributed is equal to the increase in the aggregate FAB over the period.

416. Consequently, the distribution rate can be estimated as:

$$1 - \frac{Increase\ in\ FAB}{Total\ corporate\ tax\ paid}.$$

[223] See the ABS feature article that first explains the foreign ownership calculations at http://www.abs.gov.au/AUSSTATS/abs@.nsf/Previousproducts/5306.0Feature%20Article150Jun%201992?opendocument&tabname=Summary&prodno=5306.0&issue=Jun%201992&num=&view=.

417. This method of estimating the distribution rate consistently produces estimates close to 70%. See, for example, NERA (2013, p. 5).

418. Estimation of the redemption rate requires the use of the ATO dividend flow data. The redemption rate can be estimated as the ratio of redeemed credits to distributed credits. The ATO dividend flow data includes information about both of these components. However, a series of calculations are required to determine the amount of distributed credits because some credits are distributed to other companies, and will be added to the recipient company FAB to be distributed to shareholders at a later point.

419. Hathaway (2013) shows that the ATO dividend flow data indicates that between 2004 and 2011 $204.7 billion of credits were distributed and $127.6 billion were redeemed. This suggests that 62.3% of the distributed credits were redeemed.

420. However, the ATO dividend flow data does not reconcile with the ATO FAB data. Whereas the former suggests that $204.7 billion of credits were distributed, the latter suggests that $292.2 billion were distributed. The discrepancy is obviously material and leads Hathaway (2013) to conclude that:

> I would caution anyone…against relying on those parts of my earlier reports which focused on ATO statistics.[224]

421. If the redeemed credits of $127.6 billion are expressed as a percentage of the $292.2 billion of credits that were distributed according to the FAB data, the resulting estimate of the redemption rate is only 44%. In summary, the Hathaway (2013) calculations indicate that the ATO data supports an estimate of the redemption rate in the range of 44% to 62%.[225]

422. The Guideline concludes that the ATO data supports a redemption rate in the range of 0.4 to 0.8, where the upper bound is based on an estimate reported by Handley and Maheswaran (2006) for data over the 2000-2004 period. Hathaway (2013) strongly criticises several aspects of the methodology used by Handley and Maheswaran (2006).[226] Even setting aside these methodological criticisms, the Handley-Maheswaran data is now 10 years out of date and pre-dates the Hathaway (2013) sample period entirely. Moreover, Hathaway (2013) explains that he restricts his analysis to the post-2004 period because the pre-2004 data is unreliable:

> The ATO has had a lot of trouble deciding on the appropriate data for the period 2001-2003. The past data has been revised numerous times, both up and down in the years since then. In these circumstances, I have confined my analysis to the changes in levels from 2004 onwards.[227]

423. In our view, there is no reasonable basis for any continued reliance on estimates from Handley and Maheswaran (2006). Rather, the best estimate that can be obtained from the ATO data is the range of 44% to 62% from Hathaway (2013).[228]

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224 Hathaway (2013), Paragraph 12.
225 See Hathaway (2013), Paragraphs 23-25 and AER Rate of Return Guideline, Explanatory Statement, Appendix H, Table H.3, p. 153.
226 See Hathaway (2013), pp. 42-43.
227 Hathaway(2013), Paragraphs 17-18, p. 7.
228 See Hathaway (2013), Paragraphs 23-25 and AER Rate of Return Guideline, Explanatory Statement, Appendix H, Table H.3, p. 153.

424. Lally (2013) notes the concerns that Hathaway (2010, 2013) expresses in relation to the reliability of the tax statistics data and concludes that:

> the best that can be said of all this is that the redemption rate is uncertain[229]

425. Moreover, Lally (2013) also suggests that, even if the redemption rate could be reliably estimated, it is likely to "overestimate the utilisation rate" due to the possibility of foreign investors being able to effectively transfer some credits to domestic investors.[230]

426. Also, in a report for the AER, McKenzie and Partington (2011)[231] question whether redemption rates are even fit to be used as an upper bound for theta (even assuming they could be reliably estimated). Consequently, redemption rates (whether estimated directly from ATO aggregate tax statistics or indirectly by estimating the aggregate proportion of domestic ownership and assuming that domestic shareholders will redeem) can, at most, be used as an upper bound for theta.

427. Another potential problem with this data stems from the fact that it does not discriminate between public and private companies. Many micro businesses are structured as private companies that routinely distribute all imputation credits to their (resident) owners who redeem them all. Thus, the redemption rate for these businesses will be higher than for the average exchange-listed business. In this regard, we note that all other WACC parameters are estimated with reference to exchange-listed businesses (and not private micro and small businesses) because exchange-listed businesses are more reflective of the efficient benchmark entity.

428. Finally, we note that if theta is defined (wrongly, in our view) to be the redemption rate, the ATO data could be used to estimate gamma directly, without the need to separately estimate the distribution rate and theta, as follows:

$$\begin{aligned}\gamma &= F \times \theta \\ &= \frac{Credits\ distributed}{Total\ corporate\ tax\ paid} \times \frac{Credits\ redeemed}{Credits\ distributed} \\ &= \frac{Credits\ redeemed}{Total\ corporate\ tax\ paid}.\end{aligned}$$

429. That is, the discrepancy in the amount of credits distributed can be circumvented entirely by simply taking the ratio of credits redeemed to total corporate tax paid – which is 30% (127.6/421.5).[232] In any event, our view is that this is not a valid point estimate of gamma because theta is properly interpreted as the value of distributed credits not the redemption rate.

Conclusions and recommendations in relation to the use of redemption rates

430. Our conclusions in relation to redemption rate estimates of theta are as follows:

   a) The redemption rate is the ratio of redeemed credits to distributed credits and can be estimated in two ways:

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[229] Lally (2013), p. 15.
[230] Lally (2013), p. 15.
[231] McKenzie and Partington, (2011), p. 6.
[232] See Hathaway (2013), Figure 1, p. 8.

i) Using aggregate tax statistics published by the ATO relating to the distribution and redemption of imputation credits; and

ii) By estimating the proportion of Australian shares that are held by resident investors, and assuming that those resident investors will redeem any imputation credit they receive;

b) If theta is interpreted as the value of a distributed credit, redemption rates cannot be used to estimate theta. Consistent with this view, the Tribunal has ruled that redemption rates cannot be used to estimate the value of a distributed credit;

c) ATO tax statistic estimates of the redemption rate are so unreliable that no sound conclusion can be drawn from them. However, the best estimate of the redemption rate that can be obtained from ATO data is the range of 44% to 62% from Hathaway (2013);

d) Equity ownership estimates of the redemption rates are also highly unreliable. In particular, the AER's 70% (domestic ownership) estimate should not be relied upon because it is:

i) Based on data from 2007 that has been superseded;

ii) Includes equity in GOCs, general government and the Reserve Bank;

iii) Includes equity in unlisted entities;

iv) Is inconsistent with the ASX estimate of domestic ownership of Australian equities; and

v) Is subject to a warning from the ABS about data problems and inaccuracies.

The best available updated estimate of domestic equity ownership is 55%.

The "conceptual goalposts test"

The rationale for the "conceptual goalposts" test

431. The Guideline materials define "the market" to reflect the impact of foreign investors to the extent that they have chosen to invest in Australian shares:

> Consistent with the 2009 WACC review, we propose to define the market as an Australian domestic market that recognises the presence of foreign investors to the extent they invest in the Australian market. This definition reflects the realities of capital markets, and sits in between the purely theoretical definitions of a 'full segregated' market and a 'fully integrated' market. This definition has critical implications for the value of imputation credits.[233]

432. In this context, Lally (2013a) notes that the weighted-average utilisation rate can only be used to estimate theta in settings where the required pre-conditions apply. In particular, those conditions only apply if Australia is assumed to be a perfectly segmented market, or a perfectly integrated market. Those conditions do not apply in the hybrid case adopted in the Guideline.

433. Lally (2013a) goes on to argue that the reasonableness of any estimate of theta can be tested by determining whether the allowed return on equity based on that estimate of theta lies between:

[233] AER (2013), Draft Rate of Return Guideline, Explanatory Statement, p. 120.

a) The allowed return on equity in a perfect segmentation world; and

b) The allowed return on equity in a perfect integration world.

434. As set out in Section 2 above, the allowed return on equity is computed as the total required return on equity less an adjustment for the value of imputation credits.

Implementation of the "conceptual goalposts" test

435. The test of whether a particular estimate of theta produces an allowed return on equity that is between the allowed return in a theoretical full segregation scenario and a theoretical full integration scenario requires estimates of what each WACC parameter would be in each of those theoretical scenarios.[234]

436. Lally (2013a) undertakes the estimation task by starting with estimates of WACC parameters from the real world and making adjustments to determine what those parameter values would be if markets were perfectly segmented and what they would be if markets were perfectly integrated. In our view, this is an impossible task. Estimating beta and MRP in the real world (reflecting the actual observable impact that foreign investors have on observable asset prices) is extremely difficult and a matter of great controversy, thousands of pages of expert submissions, and almost continual litigation. The task of estimating what beta and MRP *would be* if no foreign investment was allowed, and what they *would be* if markets were perfectly integrated is impossible.[235]

437. Even if it was possible to derive point estimates of beta and MRP as they would be in these theoretical scenarios, the reasonable ranges (or confidence intervals) around the point estimates would be very wide indeed – reflecting not just statistical estimation error, but also the extent to which the theoretical adjustments to convert estimates from their real world values to their theoretical world values might not be perfectly accurate. Indeed properly constituted ranges would likely be so wide as to render the resulting estimates of no use whatsoever.

438. However, Lally (2013a) produces point estimates of the required return on equity in these theoretical worlds to three decimal places and uses these point estimates to rule out all estimates of theta other than his own theoretically reasoned value of 1. He does not consider the possibility of *any* estimation error or of *any* model error in converting real-world estimates to their theoretical world values.[236]

439. In addition to this, all of Lally's calculations are based on a mechanistic implementation of the Sharpe-Lintner CAPM where MRP is estimated solely from the historical arithmetic mean of excess stock returns, which is inconsistent with the Guideline's approach of having regard to other relevant evidence.

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[234] See Lally (2013a), Section 3.9.

[235] For example, to properly estimate what the market risk premium would be in a world where foreign investment was banned would require the implementation of the Guideline procedure under the assumption that no foreign investment was allowed. This would require an estimate of what historical stock returns would have been had no foreign investment been allowed. It would also require a parameterisation of the DGM under the assumption that no foreign investment is allowed. This, in turn, would require an estimate of what the market dividend yield would be in the absence of foreign investment and an estimate of what growth forecasts would be if no foreign investment was allowed, and an estimate of what long-run GDP growth would be if no foreign investment was allowed. In our view, this is an impossible task.

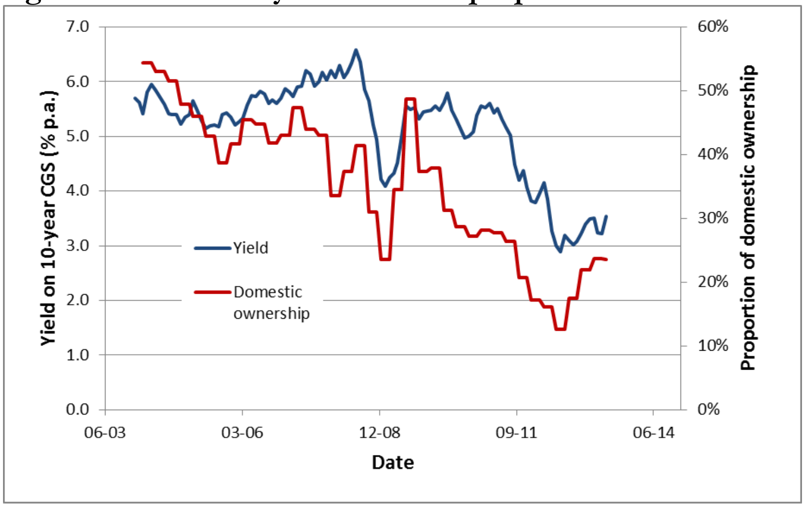
[236] Lally (2012, 2013) does consider different values for certain parameters that are used to convert from the real world to the theoretical worlds, but he assumes that his approach for converting between worlds is perfectly accurate.

The key assumption of the "conceptual goalposts" test

440. One of the most important aspects of the Lally "test" is the assumption that the risk-free rate would not change in a segmented market. In our view, this assumption is untenable. The Reserve Bank reports that more than 80% of all Australian government bonds are currently owned by foreign investors. If that demand were removed from the market entirely, the price of government bonds would surely be lower and the yield would surely be higher.[237] Yet the Lally test is based on the risk-free rate being the same in a perfect segmentation world as in a perfect integration world. Lally (2013a) uses this assumption to rule out all of the empirical evidence on theta in favour of his theoretically reasoned value of 1.

441. Given that at any point in time there is a fixed supply of Commonwealth government bonds, basic supply/demand dynamics indicate that the material reduction in demand caused by the withdrawal of all foreign ownership would result in a reduction in the price of government bonds and a consequential increase in yields. The relationship between foreign ownership and government bond yields is illustrated in Figure 10 and Figure 11 below.

Figure 10
Australian government bond yields and the proportion of domestic ownership



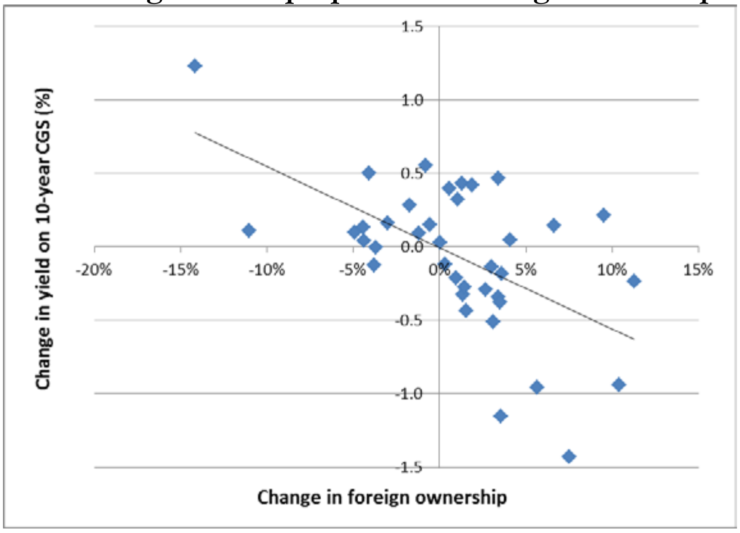
Source: RBA Statistical Tables E3 and F2.

442. Figure 10 shows that, over the last ten years, movements in government bond yields have closely mirrored movements in the proportion of domestic ownership. When the proportion of foreign investment increases (causing a reduction in domestic ownership) yields tend to fall. Conversely, when foreign investment falls, yields tend to rise. This is consistent with increases in foreign investment bidding up the price of government bonds and lowering yields.

443. Figure 11 shows the relationship between changes in government bond yields and changes in the proportion of foreign ownership over the last ten years. Increases in foreign investment are associated with decreases in government bond yields and the relationship is statistically and economically significant.[238]

[237] Given that the foreign ownership of Australian government bonds is greater than Australian ownership of foreign government bonds.
[238] *T*-statistic is -3.97, *p*-value is less than 1%, *R*-squared value is 33%.

Figure 11
The relationship between changes in Australian government bond yields and changes in the proportion of foreign ownership



Source: RBA Statistical Tables E3 and F2

444. Of course CGS yields vary for many reasons in addition to changes in the demand from foreign investors and correlation does not imply causation. However, the data from the last ten years is consistent with the basic economic principle that (other things being equal) a reduction in demand leads to a reduction in price. By contrast, the notion that the government bond yield would be unchanged if all foreign investment were withdrawn is inconsistent with basic economic principles and with the empirical data.

445. Lally (2013a) explains that his "test" is based on the assumption that government bond yields would remain the same even if all foreign investment were withdrawn on the basis that:

> CAPMs treat the risk free rate as exogenously determined, and therefore the same empirically observed rate applies to both the Officer and Solnik models.[239]

446. This simply means that the CAPM is silent on how the risk-free rate is determined. The risk-free rate is determined by the demand/supply dynamics of government bonds. The CAPM then takes the resulting risk-free rate as an exogenously determined input. However, this does not imply that the same risk-free rate should be used independent of the demand for government bonds. In a setting where there is high demand, the exogenously determined risk-free rate would be low and a low figure would be employed in the CAPM. In a setting where there is low demand, the exogenously determined risk-free rate would be high and a high figure would be employed in the CAPM. Logically, it does not follow that because the risk-free rate is exogenously determined the same value should be used in materially different settings.

447. By analogy, suppose we have a model for estimating the winning time in a marathon race. The weather conditions would be an obvious exogenous input variable – analogous to the risk-free rate in the CAPM.[240] But this does not imply that we should assume the same weather conditions for the Boston and Brisbane marathons. That is, "exogenous" means "determined by factors outside the model" – it does not mean "equal in all circumstances."

[239] Lally (2013a) Footnote 20, p. 40.

[240] Like the risk-free rate, weather conditions are relevant and they are exogenous in the sense that they are independently determined. For example, the number or quality of runners in the race does not affect what sort of weather might eventuate.

448. Moreover, if the perfect segmentation risk-free rate is increased by just 1% above the perfect integration risk-free rate, the empirical estimates based on market data pass the Lally test. In particular, Lally (2013a) concludes that the plausible range for the cost of equity is 6.8% to 7.7%.[241] The upper bound is based on calculations for the "complete segmentation" world. If the risk-free rate for the complete segmentation world was set to 1% above the risk-free rate for the complete integration world, the upper bound would be 8.7%.[242] In this case, the estimate of the cost of equity, based on theta being set to 0.35, would be squarely within the "conceptual goalposts" at 8.4%.

449. That is, even setting aside all of the problems with such a test, none of the market-based empirical estimates are ruled out unless one assumes that government bond yields would be identical whether or not foreign investors are admitted.

The results of the "conceptual goalposts" test

450. As set out above, there are two key features of the "conceptual goalposts" test that are difficult to accept:

a) It requires accurate estimates of what the required return on equity would be if Australia was a perfectly segmented market and what it would be if Australia was part of a perfectly integrated world market; and

b) It requires that the government bond yield would remain unchanged whether or not foreign investors (who currently own 80% of those bonds) are excluded from the market.

451. In our view, these features render the conceptual goalposts test useless and it should be given no weight whatsoever. If, however, one accepts these features, the next step would be to consider the result of the test. The result is that the proposed estimate of theta in the Guideline fails the test.[243] Indeed every estimate of theta generally fails the test – other than Lally's theoretically reasoned estimate of 1.

452. Moreover, the Guideline's 0.7 estimate of theta fails the conceptual goalposts test. According to Lally (2013), every estimate of theta fails the test other than his own theoretically reasoned estimate of 1. The Guideline materials cite Lally (2013, pp. 46-47) as supporting the conclusion that estimates "in the range 0.8 to 1.0 meet this test."[244] However, Lally (2013) makes no such conclusion. He never even considers an estimate of 0.8. Rather, his conclusion is that estimates "that are significantly less than 1 fail this test in virtually every case examined, and are therefore deficient"[245] and that "the only sensible estimate…is at or close to 1."[246]

453. The Guideline materials conclude that the conceptual goalposts test supports the proposed estimate of theta (0.7) on the basis that this estimate fails the test less severely than some standard empirical estimates. In our view, there are three difficulties with this conclusion:

a) The fact that the Guideline estimate fails the test would generally mean that the test does *not* support the Guideline estimate; and

241 Lally (2013a), p. 43.
242 Lally (2013a), p. 43.
243 Specifically, Lally (2013a), p. 45 concludes that the QCA theta estimate of 0.625 fails the test.
244 AER Rate of Return Guideline, Explanatory Statement, Footnote 533, p. 160.
245 Lally (2013), pp. 46-47.
246 Lally (2013), pp. 46-47.

b) Using the conceptual goalposts test to rule out the standard empirical estimates requires one to believe that:

   i) It is not possible to reliably estimate the extent to which investors value imputation credits in the real world; but

   ii) It is possible to reliably estimate (to three decimal places) the total return on equity that investors would require from the benchmark firm in a world where Australia was perfectly segmented from global capital markets, and in a world where Australia was perfectly integrated into global capital markets; and

c) The test requires that the government bond yield would remain unchanged whether or not foreign investors (who currently own 80% of those bonds) are excluded from the market.

Summary and recommendation on the conceptual goalposts test

454. In our view, the AER should not use the "conceptual goalposts" test as the basis for setting aside all of the empirical evidence based on market data in favour of a theoretically assumed theta. That test requires estimates of point estimates of what CAPM parameters would be in theoretical perfect segmentation and perfect integration worlds, it ignores estimation error, and it invokes the assumption that government bond yields would be the same in these two worlds. Such a test is not fit for any purpose, let alone the purpose of effectively excluding all available empirical evidence in favour of a theoretically assumed value. Moreover, the Guideline estimate of theta fails that test in any event.

Appendix 9: Additional dividend drop-off stability analysis

Stability and the effect of influential observations

455. The Guideline materials note that, whereas the SFG estimates have been shown to be stable and robust to the removal of influential observations, Vo et al (2013) report that:

> the estimate of theta is highly sensitive to the choice of the underlying sample of dividend events. Removing just 30 observations from a sample of 3309 can result in a dramatically different estimate of theta.[247]

456. Vo et al (2013) claim that the sensitivity of their results to the removal of influential observations is due to multicollinearity,[248] and variously refers to multicollinearity as being "strong," [249] "extreme" [250] and "severe."[251] However, no test for multicollinearity is ever performed.[252] The conclusions about multicollinearity are apparently drawn from informal observations about the correlation between dividends and imputation credits which is a necessary but insufficient condition for the estimates to have been affected by multicollinearity. Moreover, in Model Specification 2, there is only one independent variable, in which case multicollinearity is clearly impossible.

457. That is, any suggestion that there should be some a priori reason to have statistical concerns about the estimates appears to be unfounded.

458. Nevertheless, it is always useful to consider the stability of the estimates and to consider how the estimates might have been affected by influential observations.

459. For example, the SFG (2011) study contained an extensive section on stability analysis[253] whereby observations are removed in pairs consisting of the observations that have the most influential upward and downward effects on the estimate of theta, respectively. As pairs of observations are removed, theta is re-estimated to determine the sensitivity of the theta estimate to influential observations. The result is a figure such as that replicated below for Model Specification 4.[254]

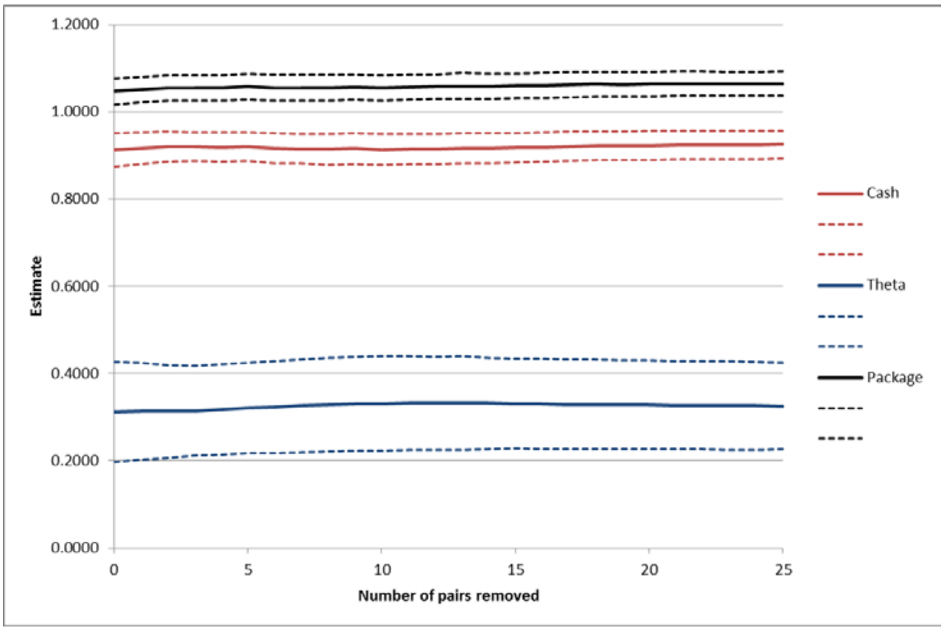
460. SFG (2011) conclude, on the basis of this stability analysis, that:

> The stability analysis for Model 4, in Figure 8 above, shows that the estimates of the value of cash dividends, the value of theta, and the value of the combined package are very stable and robust to the removal of pairs of influential data points…In summary, the stability analyses demonstrate that the estimates of theta are either maintained or lowered when pairs of influential observations are removed from the data set.[255]

461. SFG (2013) conduct a similar stability analysis for the updated data set and reach the same conclusion.

247 Vo et al (2013), p. 30.
248 Vo et al (2013), p. 13.
249 Vo et al (2013), p. 32.
250 Vo et al (2013), p. 32.
251 Vo et al (2013), p. 19.
252 Vo et al (2013), p. 26.
253 SFG (2011), pp. 28-32.
254 This appeared as Figure 8, p. 31 in SFG (2011).
255 SFG (2011), p. 31.

Figure 12. SFG stability analysis



Source: SFG (2011), Figure 8, p. 31.

462. Vo et al (2013) implement a stability analysis known as the DFBETAS approach. This approach differs from the SFG stability analysis in two primary ways:

a) Influential observations are removed one at a time, rather than in pairs; and

b) The stability analysis is only applied in relation to the non-standard approach whereby prices are not corrected for market movements over the ex-dividend day.

463. The results based on the ERA's non-standard approach are likely to be more variable and less reliable than standard estimates and this may be manifest in the stability analysis. Also recall that the Guideline materials state that "the most relevant results from the Vo et al study relate to regressions with the market adjustment."[256]

464. Given that:

a) The stability of theta estimates is clearly a key issue for Vo et al (2013) and for the AER's Guideline; and

b) The only stability analysis performed by Vo et al (2013) is in relation to the non-standard approach of making no correction for market movements over the ex-dividend day,

we apply two additional types of stability analysis using the standard Tribunal-approved methodology and the updated SFG (2103) data set.

Additional SFG stability analysis

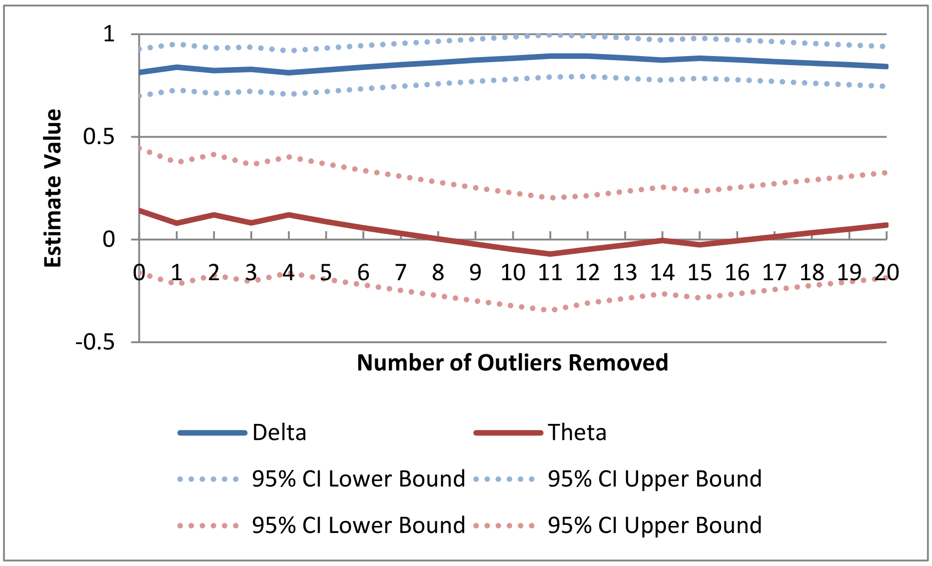
465. First, we apply the one-at-a-time influential observation (DFBETAS) approach that Vo et al (2013) employed, but using the standard ex-day market correction and our updated data set.

[256] AER Rate of Return Guideline, Explanatory Statement, Appendix H, p. 174.

466. In general, we conclude that the estimates of theta are robust to the removal of influential observations – particularly in relation to Model Specification 4, which we consider to produce the most reliable estimates.

467. Figure 13 below shows that the estimates of delta (the market value of cash dividends) and theta from Model 1 (basic model estimated via OLS) are relatively insensitive to the removal of influential observations. Even with the removal of the twenty most influential observations the estimates do not deviate markedly from their original values.

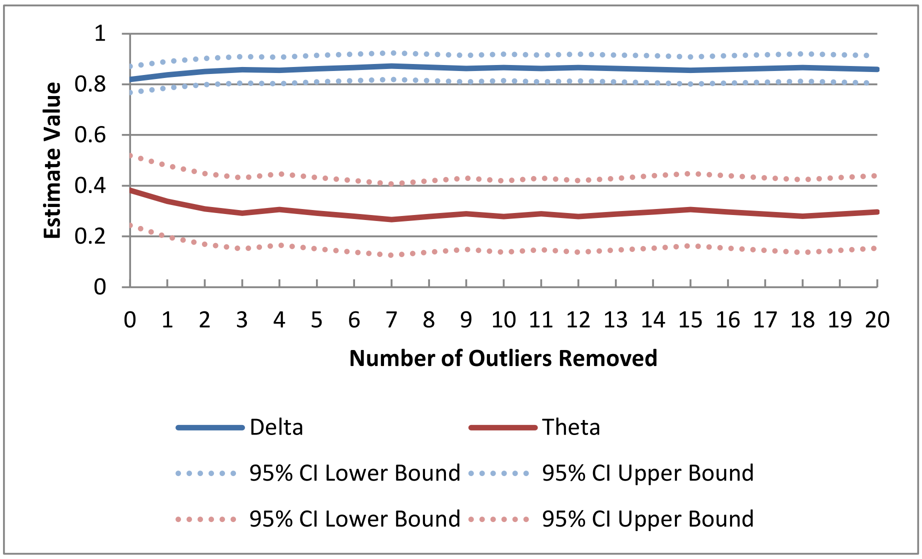
Figure 13. Sensitivity of Model 1 Delta and Theta estimates to the removal of influential observations



Source: SFG Consulting.

468. Next we examine the sensitivity of Model 2 (basic model estimated with GLS with dividend yield as the weighting variable) to the removal of the most influential observations. Again, we remove the most influential observation one at a time. Figure 14 below shows that the estimate of theta does not alter materially, although it does decline slightly.

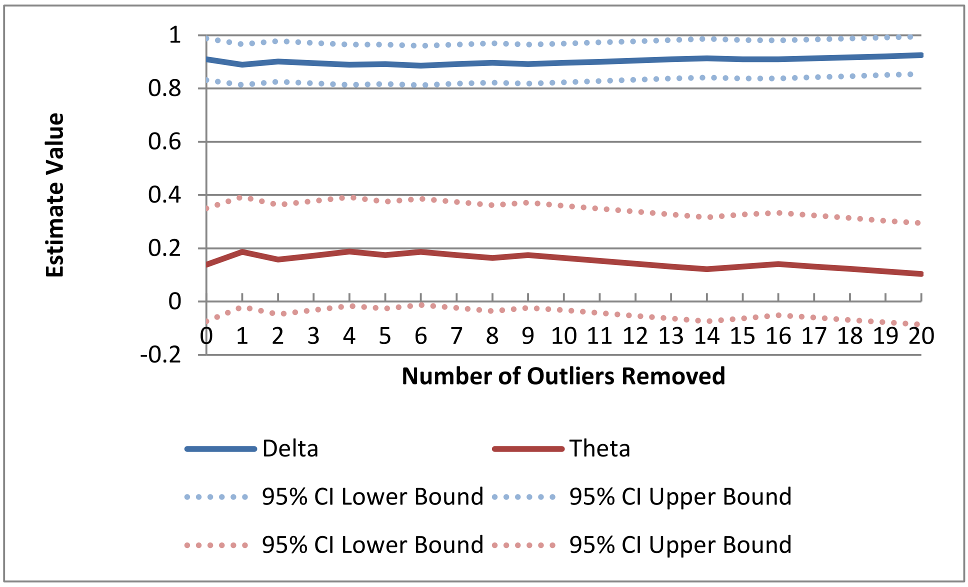
Figure 14. Sensitivity of Model 2 Delta and Theta estimates to the removal of influential observations



Source: SFG Consulting.

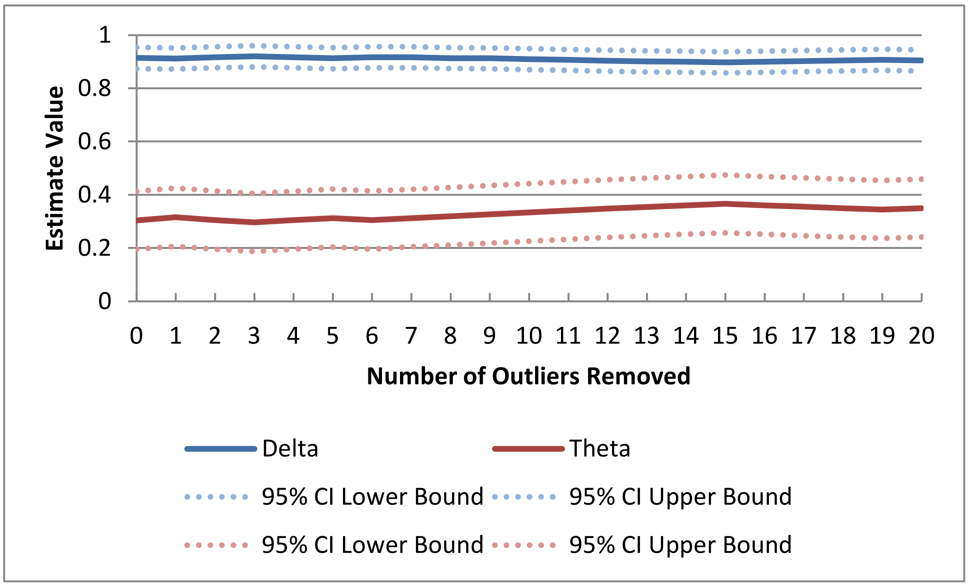
469. Next we examine the sensitivity of Model 3 (the basic model estimated with GLS with inverse stock return volatility used as the weighting variable) estimates to the removal of influential observations using the same procedure as before. Figure 15 shows, consistent with the findings for the other models, that the estimates of theta remain relatively stable.

Figure 15. Sensitivity of Model 3 Delta and Theta estimates to the removal of influential observations



470. Finally, we examine the sensitivity of Model 4 (the basic model estimated with GLS with dividend yield and inverse stock return volatility used as the weighting variables) to the removal of the influential observations. Again, we find that the estimates are not materially affected by the removal of the influential observations, as illustrated in Figure 16.

Figure 16. Sensitivity of Model 4 Delta and Theta estimates to the removal of influential observations



471. One important result that comes from the sensitivity analysis is that none of the theta estimates (for any model specification or for any number of outliers removed) reaches the 0.45 mid-point of the Vo et al range of 0.35-0.55. Overall, the estimates are stable and do not deviate markedly from the estimates prior to the removal of any influential observations. In our view, these results confirm our earlier conclusion that 0.35 represents the best available dividend drop-off estimate of theta.

Bootstrap removal of 5% of data set

472. To further test the stability of the SFG (2013) theta estimates, we conduct a randomised bootstrapping analysis. To do this, we randomly eliminate five per cent of the sample and re-estimate each of the models using the remaining data. We then repeat this procedure (on the original full sample) another 999 times, yielding 1,000 estimates of theta – each computed after a different 5% of the sample has been removed. This analysis is designed to show how sensitive the estimate of theta might be to removal of 5% of the sample observations.

473. The results from this procedure also lead us to conclude that the SFG estimates of theta are stable and robust to the removal of even 5% of the sample observations. In all cases, the 90% confidence interval is relatively narrow and close to, or below, the SFG point estimate of 0.35. Again, this is particularly the case for model specification 4, which we consider to be the most reliable.

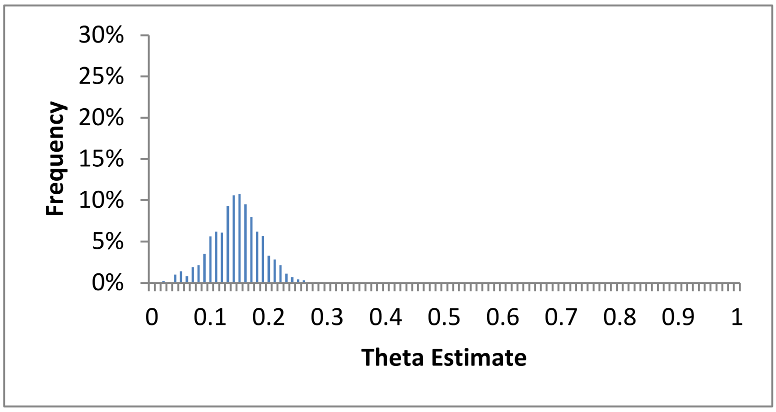
474. The results of this bootstrap test for Model 1 (basic model estimated via OLS) are set out in Table 3 below. The average theta estimate of 0.14 is consistent with the estimate when model specification 1 is applied to the full sample. The 90% confidence interval is from 0.7 to 0.21.

Table 3. Bootstrap re-sampling summary statistics for Model 1

Statistic	Theta Estimate
Average	0.140
Minimum	-0.018
Maximum	0.288
5^{th} Percentile	0.067
95^{th} Percentile	0.208

Source: SFG calculations

Figure 17. Histogram of theta estimates from simulation of Model 1



Source: SFG calculations

475. Figure 17 above shows that even under the relative extreme procedure of removing 5% of the sample there tends to be relatively little deviation from the mean theta estimate of 0.14.

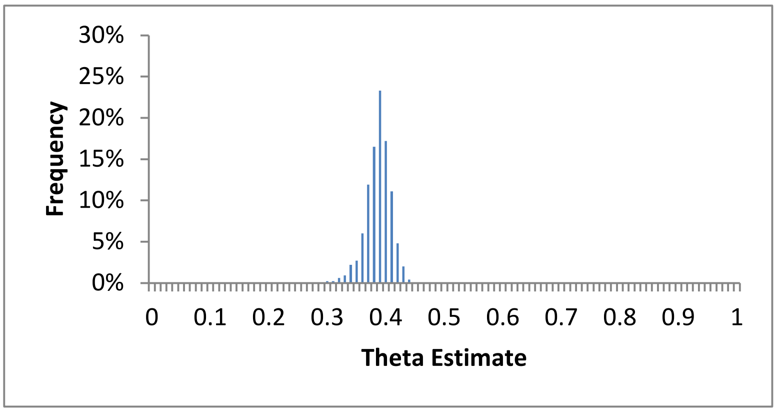
476. The results from running the bootstrap analysis for Model 2 (basic model estimated with GLS with dividend yield as the weighting variable) are set out in Table 4 below. The mean estimate is 0.38 within a narrow 90% confidence interval of 0.35 to 0.41.

Table 4. Bootstrap re-sampling summary statistics for Model 2

Statistic	Theta Estimate
Average	0.382
Minimum	0.293
Maximum	0.440
5th Percentile	0.346
95th Percentile	0.413

Source: SFG calculations

Figure 18. Histogram of theta estimates from simulation of Model 2



Source: SFG calculations

477. Figure 18 above shows the narrow distribution of theta estimates for Model Specification 2.

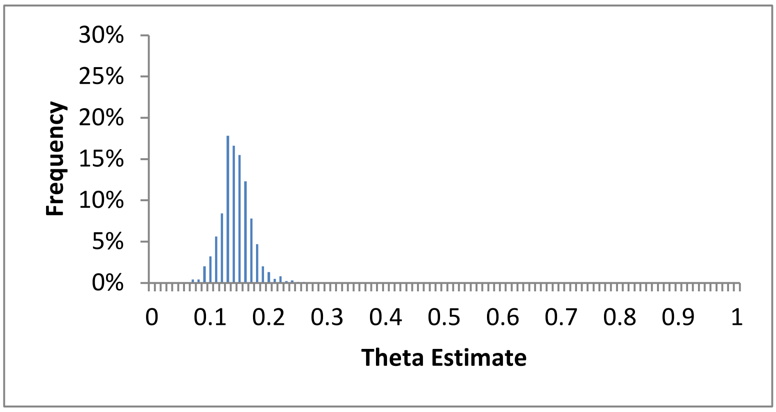
478. The results of the bootstrap re-sampling procedure for Model 3 (the basic model estimated with GLS with inverse stock return volatility used as the weighting variable) are set out in Table 5 below. The mean estimate of 0.14 is from a 90% confidence interval of 0.10 to 0.18.

Table 5. Bootstrap re-sampling summary statistics for Model 3

Statistic	Theta Estimate
Average	0.139
Minimum	0.062
Maximum	0.252
5th Percentile	0.097
95th Percentile	0.181

Source: SFG calculations

Figure 19. Histogram of theta estimates from simulation of Model 3



Source: SFG calculations

479. Figure 19 above shows that the range of estimates is similar to that for Model Specification 1, which is similar in its specification to Model 3.

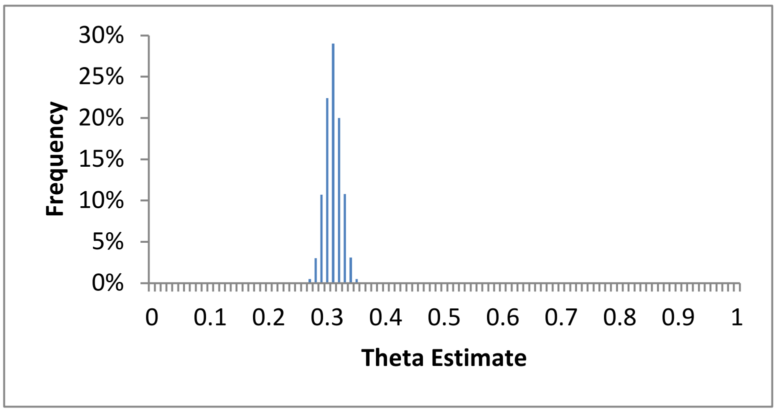
480. The results of the bootstrap re-sampling procedure for Model 4 (the basic model estimated with GLS with dividend yield and inverse stock return volatility used as the weighting variables) are set out in Table 6 below. The mean estimate of 0.31 is from a 90% confidence interval of 0.28 to 0.33.

Table 6. Bootstrap re-sampling summary statistics for Model 4

Statistic	Theta Estimate
Average	0.305
Minimum	0.262
Maximum	0.344
5th Percentile	0.282
95th Percentile	0.328

Source: SFG calculations

Figure 20. Histogram of theta estimates from simulation of Model 4



Source: SFG calculations

481. Figure 20 above shows a tightly clustered group of theta estimates centred on 0.30. The simulations provide evidence that the theta estimate from Model Specification 4 is insensitive to the removal of even 5% of the data sample.

482. As with the results obtained from the one-at-a-time removal of the most influential observations, the estimates from the resampling procedure are very stable and do not deviate materially from the estimates from the full sample. Again, as with the one-at-a-time removal, *none* of the models has an estimate value for *any* of the 1,000 simulations that is above the 0.45 mid-point of the Vo et al range of 0.35-0.55.

Conclusions in relation to SFG stability analysis

483. The additional stability analyses corroborate the results from SFG (2011) and SFG (2013) – the SFG estimates of theta are stable and robust to the removal of influential outliers and even to the removal of up to 5% of the data sample.