TransGrid

TransGrid Revenue Proposal
2018/19 – 2022/23

Appendix V

Frontier Economics:

Estimating gamma for regulatory purposes

Estimating gamma for regulatory purposes

REPORT PREPARED FOR TRANSGRID

January 2017

Estimating gamma for regulatory purposes

1 Executive summary

1.1 Instructions

1 Frontier Economics has been engaged by TransGrid to provide expert advice in relation to the estimation of the value of dividend imputation tax credits, gamma (γ).

2 Specifically, we have been asked to provide our views about:

a. Whether gamma should be interpreted in terms of the market value of imputation credits or in terms of the proportion of credits that are available to be redeemed;

b. Having regard to the answer to (a) above, what is the best currently available empirical estimate of gamma and of each component of gamma, the distribution rate and the value of distributed credits, theta;

c. Our views about the econometric issues that the AER has raised and maintained in relation to dividend drop-off analysis; and

d. Our views of the issues raised in the Lally (2016)[1] report commissioned by the AER.

1.2 Primary conclusions

3 We note that there is broad agreement that gamma should be estimated as the product of two parameters: $\gamma = F \times \theta$. The first parameter (F), is the distribution rate – the proportion of created imputation credits that are attached to dividends and distributed to shareholders. The second parameter (θ) is variously defined as "the value of distributed imputation credits" or as "the utilisation rate." While there is dispute about how each component of gamma should be interpreted and estimated, there is broad agreement that gamma is to be estimated as the product of these two components.

4 Whereas the AER proposes to define theta to be the proportion of credits that are available for distribution, our view is that theta should be interpreted and estimated as the market value of imputation credits for the following reasons:

a. The regulatory approach is to reduce the return that would otherwise be paid to shareholders by the regulator's estimate of the value of imputation credits. Consequently, the return that shareholders would otherwise receive should be reduced by the *value* of the imputation credits they receive. If the return to shareholders is reduced by the *number* of credits they receive or

[1] Lally, M., 2016, "Gamma and the ACT decision," 23 May.

redeem, instead of the *value* of those credits, they will be left under-compensated.

b. The AER estimates all other WACC parameters with regard to traded market prices. For example, the MRP is estimated with regard to stock prices and the risk-free rate is estimated with regard to government bond prices. No other WACC parameter is estimated by disregarding market evidence and applying theoretical assumptions.

c. In any event, the complex weighted-average that the AER seeks to estimate cannot be estimated without imposing a raft of assumptions. The assumptions that the AER imposes produce an upper bound for the complex weighted-average and not a point estimate.

d. The Australian Competition Tribunal has recently decided that:

   i. The Australian regulatory framework requires a market value estimate of theta;

   ii. Consistency with other WACC parameters also requires that theta be estimated on a market value basis; and

   iii. The equity ownership estimate on which the AER relies should not be interpreted as an estimate of theta, but only as an upper bound for theta.

5 In our view, the best available market value estimate of theta is the 0.35 estimate of SFG (2011, 2013).[2] The SFG estimation has been assessed by the Tribunal for its fitness for use in the regulatory setting. The Tribunal concluded that it has confidence in the SFG estimate[3] and that "No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value"[4] and that "the careful scrutiny to which SFG's report has been subjected, and SFG's comprehensive response, gives the Tribunal confidence in those conclusions."[5]

6 Our view is that, of the available estimates of the distribution rate, the traditional all-equity estimate provides the best match to the BEE. This is because the BEE is defined to be an Australian firm that need not be a listed company and which has no foreign operations. The alternative estimates considered by the AER are more materially affected by large multinationals that have substantial access to foreign profits to assist in the distribution of imputation credits.

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[2] SFG Consulting, 2013, *Updated dividend drop-off estimate of theta*, Report prepared for the Energy Networks Association, 7 June; SFG Consulting, 2011, *Dividend drop-off estimate of theta*, Report prepared for the Australian Competition Tribunal.

[3] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.

[4] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.

[5] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.

7 Thus, our view is that gamma should be set to 0.25 (the product of 0.35 and 0.7), consistent with the findings of the Australian Competition Tribunal (Tribunal) in the *ENERGEX*[6] and *PIAC-Ausgrid*[7] cases.

8 We note that the *SAPN*[8] Tribunal held that it was open to the AER to adopt a different estimate of gamma. Section 9 of this report specifically addresses the new arguments that have been raised by the Tribunal in the *SAPN* decision. We also note that the *PIAC-Ausgrid* and *SAPN* decisions have both been appealed to the Full Federal Court and that the Tribunal is yet to hand down its decision in relation to the merits review brought by the Victorian electricity distribution businesses. We explain in this report why none of this recent activity leads us to change our conclusion on the appropriate estimate of gamma.

1.3 Author of report

9 This report has been authored by Professor Stephen Gray, Professor of Finance at the UQ Business School, University of Queensland and Director of Frontier Economics, a specialist economics and 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 20 years' experience advising regulators, government agencies and regulated businesses on cost of capital issues. I have published several papers on the estimation of gamma, including in the *Journal of Financial Economics*, one of the leading international finance journals. A copy of my curriculum vitae is attached as an appendix to this report.

10 My opinions set out in this report are based on the specialist knowledge acquired from my training and experience set out above. I have been provided with a copy of the Federal Court's Expert Evidence Practice Note GPN-EXPT, which comprises the guidelines for expert witnesses in the Federal Court of Australia. I have read, understood and complied with the Practice Note and the Harmonised Expert Witness Code of Conduct that is attached to it.

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[6] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011).

[7] Applications by Public Interest Advocacy Service Ltd and Ausgrid Distribution [2016] ACompT 1 (26 February 2016).

[8] *Application by SA Power Networks* [2016] ACompT11.

2 Background and context

2.1 The role of gamma in the regulatory process

11 In the Australian regulatory setting, the regulator estimates the return that investors would require to provide equity capital to the firm and then allows the firm to charge prices so that it is able to pay that return to the investors. In the absence of imputation, this process is straightforward.

12 Consider, for example, a firm with $1,000 of equity in its RAB and a required return on equity of 7%. In this case, the equity investors require a return of $70.[9] The regulator will allow the firm to earn a pre-tax profit of $100, from which it will pay $30 corporate tax,[10] leaving $70 to return to shareholders, as required.

13 Now consider the same example with imputation, and where the regulator has determined that gamma should be set to 0.4, as the AER has done in its recent decisions. In this case, the regulator will allow the firm to earn a pre-tax profit of $85.37, from which it will pay $25.61 corporate tax (30%), leaving $59.76 to distribute to shareholders. The $25.61 of corporate tax will create $25.61 of imputation credits that are assumed to have a value of $0.4 \times 25.61 = \$10.24$. Thus, the shareholders receive $59.76 from the firm plus imputation credits that are assumed to have a value of $10.24, providing the total return of $70.00 that is required.

14 In summary, the return that shareholders would otherwise receive from the firm ($70.00) is reduced by the regulator's estimate of the value of imputation credits ($10.24).

15 To illustrate the key point of contention in relation to gamma, suppose that the regulator estimates that 40% of all credits that are created will be redeemed and sets gamma on that basis, whereas imputation credits are only valued (in aggregate by the equity market) at 25% of the face amount. In this case, the regulator will reduce the return that the shareholders would otherwise receive by $10.24, but the credits received by those shareholders would only have a value to them of $0.25 \times 25.61 = \$6.40$. This would result in shareholders being under-compensated as their return is reduced by $10.24 in relation to credits that are only worth $6.40 to them.

2.2 Points of agreement

16 There are a number of points on which there is broad agreement between consultants, regulators and regulated businesses, as set out below.

[9] $7\% \times \$1{,}000 = \$70$.

[10] Assuming a 30% corporate tax rate.

Two parameters to be estimated

17 There is broad agreement that gamma (γ) should be estimated as the product of two parameters: $\gamma = F \times \theta$. The first parameter (F) is the distribution rate – the proportion of created imputation credits that are attached to dividends and distributed to shareholders. The second parameter (θ) is variously defined as "the value of distributed imputation credits" or as "the utilisation rate." While there is dispute about how each component of gamma should be interpreted and estimated, there is broad agreement that gamma is to be estimated as the product of these two components.[11]

Agreement in relation to theta

18 There is broad agreement that two different interpretations of the second parameter, theta, have been proposed:

a. a *market value* interpretation; and

b. a *redemption proportion* interpretation.

19 There is broad agreement that:

a. If the *market value* interpretation is adopted, we should use estimation methods that are designed to estimate the market value from the market prices of traded securities; and

b. If the *redemption proportion* interpretation is adopted, we should use estimation methods that are designed to estimate the proportion of credits that are (or are likely to be) redeemed.[12]

20 There is broad agreement that estimates of the market value of credits are materially lower than estimates of the proportion of credits that might be redeemed. (Of course, if the two approaches produced similar estimates, there would be no reason for any debate).

Agreement in relation to the distribution rate

21 There is broad agreement that the distribution rate (also called the credit "payout ratio" by the AER) should be estimated as the ratio of distributed credits to created credits for the benchmark efficient entity.[13]

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[11] See, for example, the AER's Citipower Final Decision, May 2016, Attachment 4, p. 8. Throughout this report we use references to the Citipower Final Decision as an example of the AER's current approach to gamma. The Citipower decision is among the batch of the AER's most recent final decisions. The AER's approach to, and estimate of, gamma has remained the same for more than two years.

[12] Citipower Final Decision, Attachment 4, pp. 32-39.

[13] Citipower Final Decision, Attachment 4, p. 9.

2.3 Points to be determined

22 There are two key points to be determined:

a. Whether theta (θ) should be interpreted as the value that credits have to investors (as in the extent to which credits are impounded into the stock price) or as the proportion of credits that can be redeemed; and

b. Whether the distribution rate (F) for the benchmark efficient entity should be estimated with regard to a small sub-set of the largest listed companies or a broader set of companies.

3 The interpretation of theta

Background and context

23 Prior to 2013, all regulators (including the AER) had always interpreted gamma as the market value of imputation tax credits. This led regulators to estimate gamma from the market prices of traded securities – the same way they estimate all other WACC parameters such as the risk-free rate, equity beta, and the market risk premium.

24 In its December 2013 Guideline, the AER announced that it had conducted a "conceptual re-evaluation"[14] of gamma and that it intended to redefine gamma in terms of the proportion of imputation tax credits that might be redeemed. Thus, the AER proposed that it would no longer seek to estimate the value of credits to investors, but would instead estimate the proportion of those credits that investors may be able to redeem.

25 Thus, the key question that decision-makers and courts have now been confronted with is whether theta should be interpreted as:

a. The value of distributed imputation credits – in which case estimates would be based on market prices, like other WACC parameters; or

b. The proportion of credits that are available for redemption – in which case estimates of the redemption proportion would be required.

Reasons for adopting the "value" interpretation

26 In our view, the reason that the "value" interpretation is correct is obvious from a consideration of the way gamma is used in the regulatory process. As set out in Section 2.1 above, the regulatory approach is to reduce the return that would otherwise be paid to shareholders by the regulator's estimate of the value of imputation credits. Clearly, the return that shareholders would otherwise receive should be reduced by the *value* of the imputation credits they receive. If the return to shareholders is reduced by the *number* of credits they receive or redeem, instead of the *value* they obtain from those credits, they will be left under-compensated.

27 The value interpretation is also perfectly consistent with the framework of Lally (2013 AER).[15] In his Equation (1), Lally shows that what is relevant is the extent to which imputation credits are capitalised into the stock price:

$$S_0 = \frac{Y_1 - TAX_1 + IC_1U + S_1}{1 + R_f + \phi\beta_e}$$

where:

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[14] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 160.

[15] Lally, M., 2013, "The estimation of Gamma," Report for the AER, 23 November.

- S_0 is the current stock price;
- S_1 is the stock price at the end of the period;
- $Y_1 - TAX_1$ is the after-tax profit that is available to be paid out as a dividend;
- $R_f + \phi\beta_e$ is the required return on equity from the CAPM;
- IC_1 is the face amount of credits created; and
- U is the extent to which the credits are capitalised into the stock price, more commonly denoted as theta, θ.

28 A perpetuity version of the same formula appears in Lally (2016 AER), Equation (1).[16]

29 The Lally formula can be rewritten using the more common notation as follows:

$$S_0 = \frac{DIV_1 + \theta \times IC_1 + S_1}{1 + R_e}.$$

30 Thus, it is clear that theta (θ) represents the extent to which imputation credits are capitalised into the stock price – the extent to which investors value imputation credits by bidding up the stock price in relation to them. Part of the stock price is the present value of the extent to which investors value imputation credits.

31 That is, the formula above shows that the price that investors (in aggregate across the market) will be prepared to pay for a stock is:

a. The present value of any dividend they expect to receive;
b. The present value of any imputation credits; and
c. The present value of the stock price at the end of the period.

32 Theta represents the extent to which imputation credits are less valuable to investors (in aggregate across the market) than dividends and capital gains. Imputation credits will be less valuable to investors in aggregate because:

a. They are worthless to a material proportion of investors; and
b. Even those investors who do redeem credits are unlikely to value them as highly as dividends or capital gains because there are a number of costs associated with them that do not apply to dividends or capital gains.[17]

[16] Lally, M., 2016, "Gamma and the ACT decision," 23 May, p. 7.

[17] See, for example, *PIAC-Ausgrid* Reasons, Paragraph 1066 – Applications by Public Interest Advocacy Service Ltd and Ausgrid Distribution [2016] ACompT 1 (26 February 2016).

33 The Lally formula above shows that theta represents the extent to which the face amount of imputation credits is capitalised into the current stock price. There are two ways to perform this task:

a. Empirically estimate the extent to which the face amount of imputation credits *is* capitalised into the current stock price by examining the current stock price – so-called market value studies; or

b. Make a series of assumptions about how imputation credits *would be* capitalised into the stock price under those assumptions.

34 In our view, the Lally formula above shows that theta can (and should) be estimated from market data – stock prices and dividends. We develop this point further below, but the general idea is that:

a. Market prices provide direct evidence about the theta parameter in the same way that they provide direct evidence about other WACC parameters; and

b. The theoretical assumptions that are required to support the redemption proportion interpretation of theta are unreasonable and inconsistent with reality and the basis of the CAPM.

The February 2016 decision of the Australian Competition Tribunal

35 The specific issue of whether theta should be interpreted as the *value* that distributed credits have to investors or as the *proportion* of credits that might be redeemed was the subject of a recent merits review appeal brought by the NSW electricity networks. In the *PIAC-Ausgrid* case,[18] the Australian Competition Tribunal rejected the AER's "conceptual re-evaluation" and held that gamma must be interpreted as the value of credits to investors and not as the proportion that can be redeemed:

> We consider that, by placing most reliance on the equity ownership approach and effectively defining the utilisation rate as the proportion of distributed imputation credits available for redemption, the AER has adopted a conceptual approach to gamma that redefines it as the value of imputation credits that are available for redemption. This is inconsistent with the concept of gamma in the Officer Framework for the WACC.[19]
>
> …the Tribunal does not accept the AER's approach that imputation credits are valued at their claimable amount or face value (as it said in the Final Decisions: the measure is what can be claimed). The value is not what can be claimed or utilised.[20]

36 Thus, the Tribunal decided that the AER had estimated the wrong thing – a redemption proportion instead of a value – and directed the AER to re-make its

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[18] Applications by Public Interest Advocacy Service Ltd and Ausgrid Distribution [2016] ACompT 1 (26 February 2016).

[19] *PIAC-Ausgrid*, Paragraph 1100.

[20] *PIAC-Ausgrid*, Paragraph 1081.

decision with a gamma of 0.25 instead of the 0.4 figure that the AER had proposed. The 0.25 estimate is a value estimate based on market prices, and is the estimate that had been used prior to the AER's "re-evaluation."

37 In its decisions since the *PIAC-Ausgrid* judgment, the AER has continued to estimate theta as the proportion of credits that are available to be redeemed. In doing this, the AER relies primarily on the "equity ownership" approach to estimate the proportion of credits that might be redeemed. This involves simply estimating the proportion of Australian equity that is owned by resident investors. This equity ownership approach was singled out for special criticism by the Tribunal:

> The AER's equity ownership and tax statistics approaches consequently make no attempt to assess the value of imputation credits to shareholders…The Tribunal considers these approaches to be inconsistent with a proper interpretation of the Officer Framework.[21]
>
> The Tribunal considers that the equity ownership approach overstates the redemption rate. We agree with the Network Applicants' submission that "even on the AER's own definition of theta (focussing on potential utilisation by eligible investors), equity ownership rates are above the true maximum possible figure for theta".[22]

38 The Tribunal also noted that the AER's approach to estimating theta was inconsistent with the approach to estimating all other WACC parameters. All other parameters are estimated as market values using the prices of traded securities:

> Moreover, the AER's reasoning ignores the fact that other parameters in the WACC calculations are market values.[23]
>
> …the Tribunal considers the use of market studies to estimate the value of imputation credits is consistent with the methods used to calculate other parameters of the costs of debt and equity from market data.[24]
>
> Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[25]

39 The Tribunal's conclusion is very clear on this point:

> …the AER has adopted a conceptual approach to gamma that redefines it as the value of imputation credits that are available for redemption. This is inconsistent with the concept of gamma in the Officer Framework for the WACC.[26]

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[21] *PIAC-Ausgrid*, Paragraph 1095.

[22] *PIAC-Ausgrid*, Paragraph 1093.

[23] *PIAC-Ausgrid*, Paragraph 1073.

[24] *PIAC-Ausgrid*, Paragraph 1097.

[25] *PIAC-Ausgrid*, Paragraph 1098.

[26] *PIAC-Ausgrid*, Paragraph 1100.

40 The Tribunal is also very clear about the fact that it is not enough to simply look at the *number* of credits that might be redeemed – it is also necessary to determine the *value* to investors of any credits that they redeem:

> …it is necessary to consider both the eligibility of investors to redeem imputation credits and the extent to which investors determine the worth of imputation credits to them.[27]

The AER's response to the Tribunal's decision

41 In its recent decisions, the AER has stated that:

> The Tribunal ordered the remittal of our final decisions for these service providers, with directions to remake our decision by reference to an estimated cost of corporate income tax based on a gamma of 0.25. We consider that the Tribunal erred in reaching its conclusion and we have sought review of the Tribunal's decision in the Federal Court.[28]

42 That is, the AER has not raised new arguments in relation to gamma. Rather, in its recent decisions the AER has decided that the Tribunal erred in assessing the arguments put before it in *PIAC-Ausgrid*. Consequently, the remainder of this report considers the points of dispute between the AER and the Tribunal, and explains why, in our view, the Tribunal's decision is correct.

The rationale for the AER's approach to estimating theta

43 In its recent final decisions, the AER clearly states the reason for the approach that it currently adopts to estimating theta:

> We consider the utilisation value [theta] reflects the weighted average, by wealth and risk aversion, of the utilisation rates of investors.[29]

44 The AER also refers to its approach as requiring:

> …a complex weighted average over all investors holding risky assets, where the weights involve each investor's investment in risky assets and their risk aversion.[30]

45 That is, the AER defines theta to be a complex weighted-average that requires information about the total wealth of each investor in the economy and about the extent to which each investor is averse to risk. Suppose for a moment that it was possible to obtain that information and to compute the complex weighted-average that is described above, and that the result was higher than the market value of credits to investors. In that case, the AER approach would be to announce to investors that, even though the investors actually valued the credits at $X, their returns would be reduced by more than $X because that is what the AER has estimated the theoretical complex weighted average to be – that if the investors had only behaved in accordance with the AER's theoretical assumptions they

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[27] *PIAC-Ausgrid*, Paragraph 1061.

[28] Citipower Final Decision, Attachment 4, p. 9.

[29] Citipower Final Decision, Attachment 4, p. 11.

[30] Citipower Final Decision, Attachment 4, p. 79.

would have placed a higher value on the credits, in which case the reduction in the allowed return would have been fair.

The use of market data is correct and consistent with the approach to other WACC parameters[31]

46 In our view, the AER should use the actual value of credits in the real-world market, not some theoretical construct that it has estimated indirectly. Such a market-based approach would be consistent with the AER's approach to every other WACC parameter. For example, under the CAPM, the composition of the market portfolio also depends on the same complex weighted-average that is a function of the wealth and risk-aversion of the investors in the market. But the required return on the market is not estimated by making assumptions about which investors have how much wealth or what level of risk-aversion. Rather, it is estimated with regard to real-world stock returns. This is perfectly appropriate because those real-world stock returns reflect the outcome of trading between investors, and consequently, the effect that wealth and risk-aversion has had on that trading and on each investor's assessment of the value of each stock to them.

47 Moreover, the mathematical derivation of the CAPM is based on the assumptions of no taxes and no transactions costs and that investors make investments for a single period. But for the CAPM (or any economic model) to be of any use in practice, it must reflect real-world realities as much as possible. This is why we estimate CAPM parameters from market prices that reflect all of the real-world considerations that investors make when determining how much an asset is worth to them. We do not estimate what stock prices *would be* if investors had ignored taxes or transactions costs or the fact that the world will continue beyond the end of the single period. Rather, we use market prices that reflect all of those considerations. We do that in order to obtain practically useful results from the model.

48 The same also applies when estimating the risk-free rate. We don't make assumptions about the personal circumstances and characteristics of different investors and how that might affect their motivation to trade in government bonds. Rather, we simply use bond prices observed in the real world – where those prices fully reflect the aggregate motivation to trade of all investors in the market.

49 That is, our view is that theta should be estimated in the same was as every other WACC parameter.

50 The Tribunal made precisely this point in *PIAC-Ausgrid*:

> The Tribunal accepts the Network Applicants' submission that the return on equity is derived from the market prices of government bonds (the risk-free rate) and from the market prices of shares (beta and MRP). The cost of debt is calculated by reference to bond yields. Bond yields are derived directly from the traded market prices of bonds. Further, we accept the Network Applicants' submission that these market prices reflect every consideration that investors

[31] Further detail on the issues in this subsection are set out in Section 4 below.

> make in determining the worth of shares to them and that the bond prices, and the yields that are derived from them, reflect every consideration that investors make in determining the worth of the asset to them, including "personal costs".[32] Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[33]

The additional assumptions that the AER has made[34]

51 Another point to note is that, under the theoretical models that the AER relies upon,[35] there is a correspondence between the complex weighted-average and the market value. Under the assumptions of these models, it is the complex weighted-average that is capitalised into the stock price. That is, if all of the assumptions of those models were true, the complex weighted-average would be the same as the market value. Under these assumptions, one could either estimate the wealth and risk aversion of every investor and take the complex weighted average over them, or one could estimate the value of credits from market prices – the two would be identical.

52 In reality, however, direct estimation of the complex weighted-average is impossible, because data on investor wealth and risk-aversion is unavailable. Thus, further simplifying assumptions are required. The additional assumptions that the AER has made include:

a. Every credit that is redeemed has a value (to the investor who redeems it) equal to the full face amount;

b. All investors are equally risk-averse; and

c. All investors (domestic and foreign) have no wealth other than that which they invest in Australia.[36]

53 These assumptions are clearly implausible, and relaxing them would result in a lower estimate of the complex weighted-average. That is, an estimate of the complex weighted-average that is based on these additional assumptions (which the AER employs) will be an upper bound for the true figure. Again, the Tribunal has recently reached precisely the same conclusion:

> …theta estimates produced by the equity ownership approach and tax statistics can be no better than upper bounds on the market value of imputation credits. Given that two of the three approaches adopted by the AER are considered no

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[32] The AER had used the term "personal costs" to summarise the various reasons why investors would not value credits that they redeemed at the full face amount.

[33] *PIAC-Ausgrid*, Paragraph 1098.

[34] Further detail on the issues in this subsection are set out in Section 7.3 below.

[35] See, for example, Citipower Final Decision, Attachment 4, p. 79.

[36] This assumption could be replaced by the equally implausible assumption that investors make their Australian investments completely independent of any investments that they hold outside of Australia – that they pay no regard at all to the correlation between the returns on domestic and foreign assets. As well as being implausible and inconsistent with common sense, this assumption directly contradicts the very basis of the CAPM because it suggests that investors do not maximise utility over their investment portfolios.

> better than upper bounds, it follows that the assessment of theta must rely on market studies. The Tribunal considers that, of the various methodologies for estimating gamma employed by the AER, market value studies are best placed to capture the considerations that investors make in determining the worth of imputation credits to them.

The basis for dividend drop-off analysis

54 Finally, we note that the market value estimate of theta (e.g., via dividend drop-off analysis) is perfectly consistent with the theoretical framework of Lally (2013, 2016). As set out above, Lally (2013 AER) Equation (3) shows that what is relevant is the extent to which imputation credits are capitalised into the stock price:

$$S_0 = \frac{DIV_1 + \theta \times IC_1 + S_1}{1 + R_e}.$$

55 This formula can then be rearranged slightly as follows:

$$S_0(1 + R_e) - S_1 = DIV_1 + \theta \times IC_1.$$

56 Dividing all terms by the current stock price gives:

$$\frac{S_0(1 + R_e) - S_1}{S_0} = \frac{DIV_1}{S_0} + \theta \frac{IC_1}{S_0}.$$

57 This expression is entirely consistent with dividend drop-off regression analysis, which is performed as follows:

$$\frac{S_0(1 + R_e) - S_1}{S_0} = \delta \frac{DIV_1}{S_0} + \theta \frac{IC_1}{S_0} + \varepsilon.$$

58 That is, Lally (2013, 2016) shows that what is relevant is the extent to which imputation credits are capitalised into the stock price and dividend drop-off analysis specifically seeks to estimate the extent to which imputation credits are capitalised into the stock price using a regression specification that is entirely consistent with the Lally formula.

Conclusions in relation to theta

59 In our view, theta should be interpreted and estimated as the market value of imputation credits for the following reasons:

a. The regulatory approach is to reduce the return that would otherwise be paid to shareholders by the regulator's estimate of the value of imputation credits. Consequently, the return that shareholders would otherwise receive should be reduced by the *value* of the imputation credits they receive. If the return to shareholders is reduced by the *number* of credits they receive or redeem, instead of the *value* of those credits, they will be left under-compensated.

b. The AER estimates all other WACC parameters with regard to traded market prices. For example the MRP is estimated with

regard to stock prices and the risk-free rate is estimated with regard to government bond prices. No other WACC parameter is estimated by disregarding market evidence and applying theoretical assumptions.

c. In any event, the complex weighted-average that the AER seeks to estimate cannot be estimated without imposing a raft of additional simplifying assumptions. The assumptions that the AER imposes produce an upper bound for the complex weighted-average and not a point estimate.

d. The Australian Competition Tribunal has recently decided that:

   i. The Australian regulatory framework requires a market value estimate of theta;

   ii. Consistency with other WACC parameters also requires that theta be estimated on a market value basis; and

   iii. The equity ownership estimate on which the AER relies should not be interpreted as an estimate of theta, but only as an upper bound for theta.

60 In our view, the best available market value estimate of theta is the 0.35 estimate of SFG (2011, 2013).[37] The SFG estimation has been assessed by the Tribunal for its fitness for use in the regulatory setting. The Tribunal concluded that it has confidence in the SFG estimate[38] and that "No other dividend drop-off study estimate has any claims to be given weight vis-à-vis the SFG report value"[39] and that "the careful scrutiny to which SFG's report has been subjected, and SFG's comprehensive response, gives the Tribunal confidence in those conclusions."[40]

[37] SFG Consulting, 2013, *Updated dividend drop-off estimate of theta*, Report prepared for the Energy Networks Association, 7 June; SFG Consulting, 2011, *Dividend drop-off estimate of theta*, Report prepared for the Australian Competition Tribunal.

[38] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.

[39] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 38.

[40] Application by Energex Limited (Gamma) (No 5) [2011] ACompT 9 (12 May 2011), Paragraph 22.

4 The AER's approach to estimating other WACC parameters

4.1 The AER's rejection of the Tribunal's reasons

61 In *PIAC-Ausgrid*, the Tribunal noted that the AER's approach to estimating theta was inconsistent with the approach to estimating all other WACC parameters. All other parameters are estimated as market values using the prices of traded securities:

> Moreover, the AER's reasoning ignores the fact that other parameters in the WACC calculations are market values.[41]
>
> …the Tribunal considers the use of market studies to estimate the value of imputation credits is consistent with the methods used to calculate other parameters of the costs of debt and equity from market data.[42]
>
> Consequently, placing significant weight on market value studies is, in the Tribunal's view, consistent with evidence relied on by the AER to calculate the rate of return on capital.[43]

62 In its recent decisions, the AER argues that the Tribunal erred in its decision and states that:

> …we use a combination of market values and face values. When determining whether to use market value or face value, we have to consider whether it is consistent with the Officer framework.[44]

63 However, the AER seems to have entirely missed the Tribunal's point. To see this, we consider how the AER goes about estimating other WACC parameters.

Estimating the risk-free rate

64 We begin by noting that when the AER estimates the risk-free rate it estimates the yield from the observed market price of government bonds. The market price of the bond reflects the value (in the usual sense of 'worth') of the promised coupon payments to investors. It reflects all of the considerations that investors have in determining how much the coupon payments are worth to them, including any taxes, transaction costs, time value considerations, and portfolio effects – anything that affects the value to investors. The yield then reflects all of these considerations that affect value. The yield (which is derived from the market price of the bond) represents the return that investors require to compensate them for *all* of the items set out above. The AER then sets the allowed return on the basis of the market-derived yield. That is, the AER sets the allowed return to provide investors with

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[41] *PIAC-Ausgrid*, Paragraph 1073.

[42] *PIAC-Ausgrid*, Paragraph 1097.

[43] *PIAC-Ausgrid*, Paragraph 1098.

[44] Citipower Final Decision, Attachment 4, p. 98.

compensation for *all* of the considerations they had when determining what a government bond would be worth to them. In our view, this is entirely appropriate.

Estimating the allowed return on debt

65 The same applies to corporate bonds when the AER estimates the required return on debt. A corporate bond is a company's promise to make a specified series of payments to the bond holder and the current price of the bond (which the AER uses to determine the yield and consequently the allowed return on debt) reflects the *value* of these payments to investors. It reflects *all* of the considerations that investors might make in deciding how much the promised payments are worth to them. These considerations include the extent to which the company might default on its obligations, the likely recovery rate in the event of a default, any transactions costs that investors would have to bear, how attractive the bond is to an investor from a portfolio diversification perspective, and so on. All of these considerations are reflected in the bond price, so they are consequently reflected in the observed yield and the allowed return on debt.

Estimating the allowed return on equity

66 The same also applies to share prices, which the AER uses to determine the allowed return on equity. Share prices reflect *all* considerations that investors have when deciding how much they would be willing to pay for a share. When deciding how much a share is worth to them, investors will have regard to the *value* to them of likely future dividends and imputation credits and capital gains, transaction costs, the portfolio diversification benefits of owning that share, and so on. All of these considerations across all investors in the market are incorporated into the stock price. Those stock prices are then used to estimate the MRP and beta and thus determine the allowed return on equity.

4.2 The AER's current contention

67 As set out above, the allowed return on debt and the allowed return on equity are based on the market prices of traded securities. Those market prices reflect all considerations that investors have when determining the value of that security to them. The dividend drop-off estimate of theta is made on precisely the same basis.

68 In its recent decisions, the AER argues that it should begin with the face amount of imputation credits, given that:

a. It combines the face amount of coupons with the market price of bonds when determining the allowed return on debt; and

b. It combines the face amount of dividends with the market price of shares when determining the allowed return on equity.

69 We agree entirely. For all WACC parameters, the approach is to begin with the face amount of the payments and to use market prices to determine the *value* of those payments – where the market price reflects all of the considerations that investors make in determining the value of that series of payments to them.

70 Thus, we should begin with the total face amount of distributed credits and then theta represents the extent to which the value of each credit is less than the face amount. Thus, theta converts the face amount of credits into the market value of those credits. It plays exactly the same role as a bond yield – it converts the face amount into a market value.

71 Moreover, the PTRM already does exactly this – the face amount of credits is computed as the amount of corporate tax paid by the BEE. That face value is then multiplied by the distribution rate to produce the face amount of distributed credits and then multiplied by theta to produce an estimate of the value of those distributed credits.[45]

72 Another way to see this is via the Lally formula that was set out above:

$$S_0 = \frac{DIV_1 + \theta \times IC_1 + S_1}{1 + R_e}$$

where IC_1 is the face amount of credits and θ represents the extent to which those credits are valued by investors (as reflected in the share price).

73 The source of the AER's confusion on this point is that it seems to think that theta itself should have some sort of 'face value' interpretation. By contrast, the face amount of credits is multiplied by theta to produce an estimate of the market value of credits. Theta is not a face amount – theta is the parameter that converts the face amount into a market value. In the same way, a bond yield is not a face amount – it is the parameter that converts the face amount into a market value.

[45] In the PTRM, the last two steps are combined by multiplying the face amount of credits by gamma.

5 The distribution rate

5.1 Background and context

74 In the Australian regulatory setting, the long-standing approach to estimating the distribution rate is to use data from the Australian Tax Office (ATO) on:

a. Total credits created; and

b. Total credits distributed.

75 It is broadly accepted that this approach produces an estimate of approximately 0.7.[46]

76 In its recent decisions,[47] the AER considers three alternative estimates of the distribution rate:

a. The conventional estimate of 0.7;

b. An estimate based on listed equity only of 0.75; and

c. An estimate based on 20 large listed firms of 0.83.

77 In our view, the preferred approach is to select an estimate based on compatibility with the BEE. However, the AER's approach is to maintain three different estimates and to pair those estimates with different estimates of theta. For the reasons set out below, we consider that approach to be unlikely to lead to an appropriate estimate of gamma.

5.2 The key problem with the '20 firms' estimation approach

The '20 firms' estimation approach

78 In its recent decisions,[48] the AER cites an estimate of the distribution rate developed by Lally (2016).[49] Lally selects the 20 largest listed companies and for each he estimates:

$$\frac{Credits\ Distributed}{Credits\ Distributed + Credits\ Not\ Distributed}$$

over a 13-year period, where Credits Distributed is inferred from total dividends paid and Credits Not Distributed is inferred from the change in the firm's Franking Account Balance. This approach produces a distribution rate estimate of 0.83.[50]

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[46] Citipower Final Decision, Attachment 4, pp. 29-30.

[47] Citipower Final Decision, Attachment 4, p. 26.

[48] Citipower Final Decision, Attachment 4, p. 26.

[49] Lally, M., *Gamma and the ACT decision*, 23 May.

[50] Citipower Final Decision, Attachment 4, p. 26.

The AER's use of the '20 firms' approach

79 For a number of years, Dr Lally has been providing regulators with an estimate of the distribution rate that is based on his analysis of 20 large multinational firms. In its October 2015 final decisions, the AER cited this evidence, but did not use it when constructing its estimates of gamma. Rather, the AER stated that it took from this evidence nothing more than that it was consistent with the notion that the distribution rate is higher among listed firms than other firms:

> Lally examined the financial statements of the 20 largest ASX-listed firms by market capitalisation, and found an aggregate distribution rate across these firms of 0.84. We consider that this broadly reinforces the higher cumulative payout ratio estimate across only listed equity.[51]

80 However, in its most recent decisions, the AER has given the Lally estimates equal billing with its standard cumulative payout estimates. The Lally estimates are included in the main table of results and are used directly in the computation of gamma estimates.[52]

81 The AER does not explain why the same evidence that was used in one way in the 2015 decisions has now been elevated to form the basis of gamma estimates that appear to receive as much weight as any other gamma estimates. However, in our view this is a moot point because, as explained below, the '20 firms' estimate is inappropriate and should not be used at all.

The key problem with the '20 firms' estimation approach

82 In a previous report submitted to the AER,[53] we identify a fundamental flaw in the 20 firms approach to estimating the distribution rate. The 20 companies in the Lally sample are predominantly very large multinationals with a material amount of foreign-sourced income. This foreign income can be used to distribute imputation credits, so that the distribution rate is higher than it could be for a firm that did not have access to foreign income to assist in the distribution of imputation credits. Since the firms that are regulated by the AER are (by definition) purely domestic firms, they have no access to foreign income. Consequently, estimating the distribution rate for a firm with *no* foreign income by using a sample of 20 firms with *substantial* foreign income is inappropriate.

83 The problem can be explained via a simple numerical example. Consider two firms that each earn a $100 profit, pay $30 tax, and then pay a dividend of $49 (which represents 70% of the $70 net profit after tax).

84 The first firm has no foreign income, so all of the profits and all of the tax occurs within Australia. Thus, the $30 of corporate tax creates $30 of imputation credits.

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[51] SAPN Final Decision, Attachment 4, p. 89.

[52] Citipower Final Decision, Attachment 4, Tables 4-3 and 4-4, p. 26.

[53] Frontier Economics, 2015, "An appropriate regulatory estimate of gamma," June.

The amount of credits that can be attached to the $49 dividend is only $21.[54] Consequently, the distribution rate is:

$$\frac{Credits\ Distributed}{Credits\ Created} = \frac{21}{30} = 70\%.$$

85 The second firm is identical to the first in all respects except that 70% of its business is in Australia and 30% is offshore. This firm will pay 70% of its corporate tax to the ATO and therefore creates $21[55] of credits. It will then pay the same dividend of $49, representing the same 70% of its net profit after tax. Like the first firm, $21 of credits can be attached to the $49 dividend. This represents a 100% distribution rate:

$$\frac{Credits\ Distributed}{Credits\ Created} = \frac{21}{21} = 100\%.$$

86 The second firm is able to attach credits to dividends paid out of offshore profits, whereas the first firm has no access to such offshore profits. For any given dividend payout policy, a firm with foreign profits will be able to distribute a larger proportion of its credits than a firm with no access to foreign profits. This is illustrated in Figure 1 below. Point A on the graph represents the purely domestic firm in the above example and Point B represents the multinational. For a given dividend payout rate, a firm with relatively more foreign profits will be able to distribute a larger proportion of the imputation credits that it creates.

87 Of course, this is not to say that we should expect a monotonic relationship between the proportion of foreign profits and the imputation credit distribution rate. To see this, consider firms X and Y. X has a higher proportion of foreign profits than Y, but its lower dividend payout rate means that it distributes a smaller proportion of the imputation credits that it creates.

88 The figure below shows that for any given dividend payout rate, a firm with a higher proportion of foreign profits will be able to distribute a higher proportion of the imputation credits that it creates. Thus, giving more weight to firms with a high proportion of foreign profits will have the effect of increasing the estimate of the imputation credit distribution rate, other things being equal. Since the benchmark efficient entity has zero foreign profits, by definition, it would be inappropriate to increase the weight applied to firms with large foreign profits.

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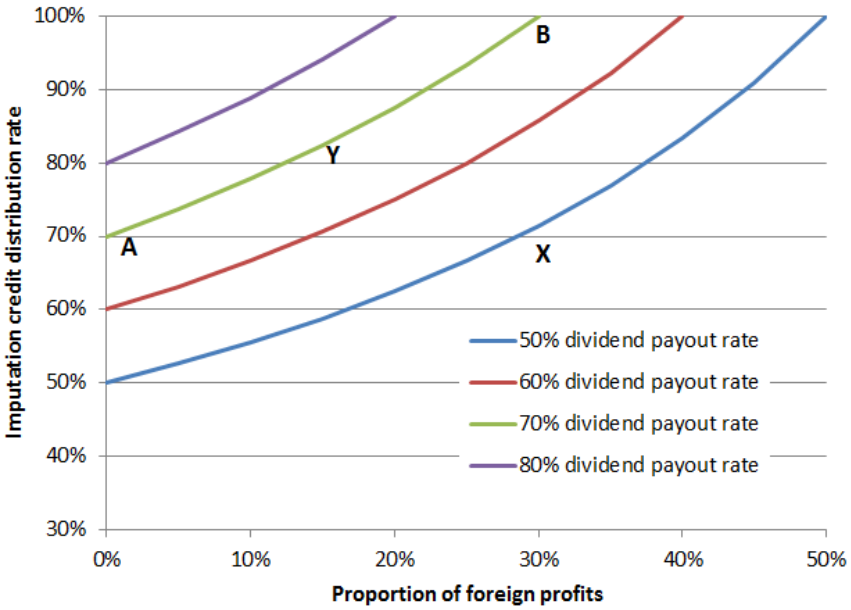
[54] 49 × 0.3 / (1-0.3) = 21.

[55] 70% × 30 = 21.

Figure 1: The effect of foreign profits on imputation credit distribution rates



Source: Frontier Economics calculations based on corporate tax rates of 30%.

89 In our view, the AER has erred in using a sample of large multinationals with substantial offshore profits to estimate the imputation credit distribution rate. This is because the firms that the AER regulates have no access to any such offshore profits, by definition.

The AER's response

90 The AER make two points in response to the problems with the 20 firm approach that have been raised above.

Variation in dividend payout policies across firms

91 First, the AER notes that different firms will adopt different dividend payout ratios for a number of reasons.[56] This is self-evidently true. But the problem here is that *for any given dividend payout ratio*, the imputation credit distribution rate is an increasing function of the proportion of foreign profits – as shown in Figure 1 above. Whatever the payout ratio, foreign profits enable the firm to distribute a higher proportion of credits than they would otherwise be able to – and the BEE does not have access to any foreign profits, by definition.

Do large multinationals have higher imputation credit distribution rates?

92 The second response by the AER is based on an examination of 7 of the 20 large multinationals considered by Lally (2016), who concluded that (among these 7 firms) those with relatively more foreign profits had lower imputation credit distribution rates.[57]

[56] Citpower Final Decision, Attachment 4, p. 123.

[57] Citpower Final Decision, Attachment 4, p. 123.

93 However, the question here is whether large multinationals have higher imputation credit distribution rates than other firms. To answer this question, we consider it logical to compare the distribution rate of large multinationals with the distribution rate of other firms. We do not see how this question can be answered by examining a selected subset of large multinationals only. That is, we fail to see how one can determine whether A is larger than B by examining only a selected sub-set of A. The more logical approach would be to compare A against B.

94 The AER's own figures clearly show that there is a material difference. The AER adopts a distribution rate of 70% for all firms and 83% for the 20 large multinationals. Clearly, the distribution rate for large multinationals *is* greater than the distribution rate for other firms.[58]

95 Moreover, NERA (2015) use Australian Tax Office data to estimate distribution rates for various types of companies from 2000-2012. Their results are summarised in Table 1 below.

Table 1: Distribution rate 2000-2012 by company type

Firm type	Distribution rate
Top 20 ASX listed	0.840
Public, but not top 20 ASX listed	0.693
All public	0.755
Private	0.505
All companies	0.676

Source: NERA (2015), Table 3.4, p. 23.[59]

96 In our view, the evidence clearly supports the proposition that large multinationals are able to distribute a higher proportion of the imputation credits that they create, relative to the average Australian firm. Since large multinationals have access to foreign profits and the benchmark efficient firm does not, it is not appropriate to use them to estimate the distribution rate.

97 This only leaves the question of why Lally (2016) concludes, from the 7 firms he considered, that more foreign profits did not lead to a higher credit distribution rate. This is because Lally (2016) has not controlled for differences in dividend payout rates. Figure 1 above shows that a firm with a low dividend payout rate and high foreign profits (Point X) can have a lower credit distribution rate than a firm with a higher dividend payout rate and lower foreign profits (Point Y). This is precisely what happens among the 7 firms. For all but the mining firms, the dividend payout ratio is high enough to enable essentially all of the credits to be distributed. The two mining firms have low payout ratios, so even a substantial

[58] Citipower Final Decision, Attachment 4, p. 26.

[59] NERA, 2015, "Estimating distribution and redemption rates from taxation statistics," March.

proportion of foreign earnings is insufficient to enable them to distribute a higher proportion of credits. This is why it is important to consider samples of reasonable size rather than to try to draw conclusions from comparisons among a few companies.

98 Finally, we note that our Figure 1 cannot be compared directly with Lally (2016) Table 1 because Lally uses a cash-based estimate of the dividend payout rate whereas we use dividends relative to after-tax profits, and because Lally's Table 1 combines some figures from 2015 with other figures averaged over several years. However, the conceptual points are clear:

a. Mathematically, *for any given dividend payout ratio*, the imputation credit distribution rate is an increasing function of the proportion of foreign profits; and

b. The evidence clearly supports the proposition that large multinationals are able to distribute a higher proportion of the imputation credits that they create (83%), relative to the average Australian firm (70%).

Conclusion on the 20 firms approach

99 Our conclusion is that, since large multinationals have access to foreign profits and the benchmark efficient firm does not, it is not appropriate to use them to estimate the distribution rate.

5.3 'Matching' the data sets used to estimate the distribution rate and theta

100 We have previously submitted to the AER[60] that the distribution rate is a firm specific parameter because distribution policies vary across firms and theta is a market wide parameter because the value of a credit in the hands of an investor is independent of its source – in the hands of any particular investor, all imputation credits are identical.

101 Consequently, there is no reason to impose a constraint that the same data source must be used to estimate both parameters. Rather, any data that is relevant to the estimation of the distribution rate should be used to estimate that parameter, and any data that is relevant to the estimation of theta should be used for that purpose. The best estimates of each parameter should then be multiplied to produce the best estimate of gamma.

102 In its October 2015 Final Decisions, the AER set out in some detail[61] why it considered that it was required to estimate the distribution rate and theta from the

[60] Frontier Economics, 2015, "An appropriate regulatory estimate of gamma," June, p. 39.

[61] See, for example, SAPN Final Decision, Attachment 4, Appendix 10.

same subset of data. However, in its recent Final Decisions, the AER concludes that its earlier view was wrong:

> …we consider it is not necessary to 'match' estimates of distribution rates and utilisation rates based on the dataset used.[62]

103 In this regard, the AER cites the following advice from Lally (2016):

> …the distribution rate is a firm-specific parameter whilst theta is a market parameter. Thus, theta must be estimated using market-wide data whilst the distribution rate could be estimated using firm, industry, or sector-wide data according to which was judged to provide the best estimate for this firm-specific parameter. In short, consistency is *not* essential but nor is it precluded. So, on this point, I disagree with the AER (2015, section 4.4.1). Handley (2015b, pp. 7-8) discusses this issue and first acknowledges that the distribution rate is firm-specific whilst theta is not firm-specific, but then goes on to say that both parameters must be estimated from "consistent data sets which relate to the same market". This seems contradictory.[63]

104 We agree with Lally (2016) on this point – the estimation of the distribution rate should not be confined to the same subset of data that was used to estimate theta. Rather, the estimate of the distribution rate should be based on whichever set of data best matches the BEE. Lally (2016) notes that, if the data set that best matches the BEE happens to be the same data set that is used to estimate theta, that is what should be used – the AER is not precluded from using the appropriate data set just because it happens to match the data that was used to estimate theta. However, if a different data set best reflects the BEE, that is what should be used.

105 However, the AER's interpretation of this point is that it is "not precluded" from imposing on itself the unnecessary (and incorrect) restriction that its estimates of the distribution rate and theta must be based on matching data sets.[64] The AER then proceeds to continue to impose that restriction on itself, in precisely the same way as in its previous determinations. That is, the AER's recognition that there is no basis for its previous approach has not led it to make any change to that approach.

106 As set out above, our view is that, of the available estimates of the distribution rate, the traditional all-equity estimate provides the best match to the BEE. This is because the BEE is defined to be an Australian firm that need not be a listed company and which has no foreign operations. The alternative estimates considered by the AER are more materially affected by large multinationals that have substantial access to foreign profits to assist in the distribution of imputation credits.

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[62] Citipower Final Decision, Attachment 4, p. 25.

[63] Lally (2016), p. 25.

[64] Citipower Final Decision, Attachment 4, p. 25.

5.4 The Tribunal decision on the distribution rate

107 The specific issue of whether it is appropriate to estimate the distribution rate with regard to a sample of multi-nationals was also considered in the recent *PIAC-Ausgrid* case:

> The Networks Applicants say that the AER should not have relied on an estimate of the distribution rate for listed equity in estimating the distribution rate because it was likely to be unrepresentative of the distribution rate of the benchmark entity. This is because a large proportion of listed companies are multinational firms with foreign profits which will generally have an incentive [or ability] (by virtue of generating foreign-sourced income) to distribute a higher proportion of imputation credits. In contrast, the benchmark entity, by definition, is an entity with 100 percent Australian income.[65]

108 The Tribunal rejected the AER's reasons for placing weight on an estimate that was dominated by multinationals and determined that the long-standing approach of estimating the distribution rate using ATO data for all companies should be maintained:

> …the Tribunal is of the view that it is appropriate to follow past practice.[66]

5.5 Conclusions in relation to the distribution rate:

109 Our view is that, of the available estimates of the distribution rate, the traditional all-equity estimate provides the best match to the BEE. This is because the BEE is defined to be an Australian firm that need not be a listed company and which has no foreign operations. The alternative estimates considered by the AER are more materially affected by large multinationals that have substantial access to foreign profits to assist in the distribution of imputation credits.

[65] *PIAC-Ausgrid*, Paragraph 1105.

[66] *PIAC-Ausgrid*, Paragraph 1106.

6 The reliability of ATO tax statistics

110 ATO tax statistics are used for two purposes:

a. To estimate the credit distribution rate as the ratio of credits distributed to credits created; and

b. As an upper bound for theta, estimated as the ratio of credits redeemed to credits distributed.[67]

111 In its recent decisions, the AER questions the reliability of using tax statistics to inform the estimate of theta and states that it applies limited weight to such estimates.[68] The issue is as follows:

a. Each year a certain amount of credits are created, some of those are distributed to shareholders, and some of those are redeemed by shareholders.

b. The ATO provides data on the quantum of credits that are created each year and on the quantum of credits that are redeemed each year. There has never been any dispute about either of these items.

c. The ATO does not provide direct data on the number of credits that are distributed each year – so that quantity has to be derived. Two approaches have been proposed:

   i. The franking account balance (FAB) approach – whereby the amount of distributed credits is derived as the sum of all credits created less those that are retained by firms as reported in the firms' franking account balances;[69] and

   ii. The dividend approach – whereby the amount of distributed credits is estimated by tracking dividend payments and making assumptions about the flow of dividends between companies, trusts and life offices.

d. The FAB and dividend approaches produce different estimates of the amount of credits that are distributed each year.

112 The difference between the FAB and dividend estimates of the amount of credits distributed was first identified by Hathaway (2013).[70] His estimates are summarised in Figure 2 below.

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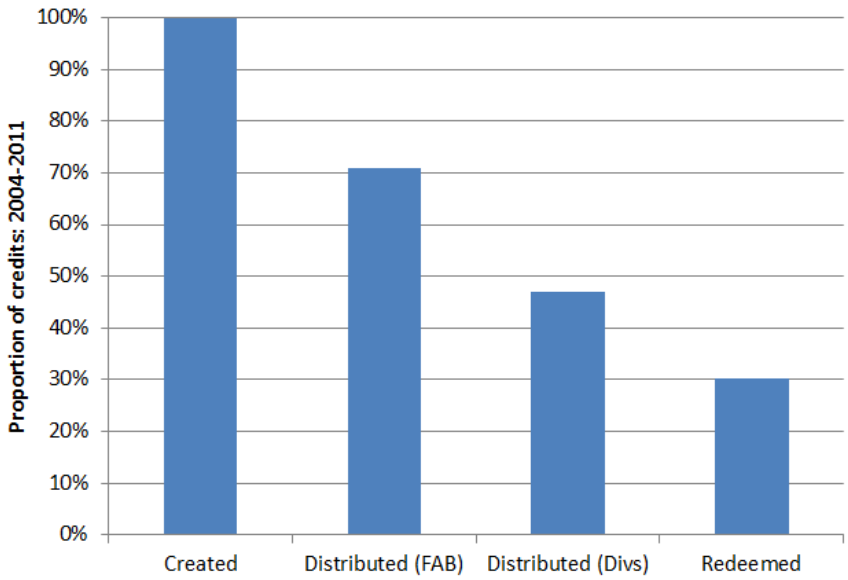
[67] We note below that the AER considers this to be a point estimate of theta.

[68] Citipower Final Decision, Attachment 4, p. 13.

[69] A firm's 'franking account balance' is a record of the face amount of imputation credits the firm has available for distribution.

[70] Hathaway, N., 2013, "Franking credit redemption ATO data 1988 to 2011," Capital Research, September.

Figure 2: Summary of ATO tax statistics



Source: Hathaway (2013), p. 9.

113 Figure 2 shows that the FAB method indicates that 71% of created credits are distributed, whereas the dividend method produces a distribution rate of 47%.

114 The AER has proposed that the ATO tax statistics can be used to estimate theta, and consequently gamma. Under this approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}}.$$

115 Note that the amount of credits distributed cancels out, so we are left with:

$$\gamma = \frac{\text{Credits Redeemed}}{\text{Credits Created}}.$$

116 In this case, there is no issue with the measurement of either term, so no reason to consider the estimate to be unreliable. Hathaway (2014) recognises this point and reports that the proportion of credits redeemed to credits created is 30%.[71]

117 Moreover, it is clear from Figure 2 above that the same outcome would be obtained whether one adopted the FAB approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}} = \frac{71}{100} \times \frac{30}{71} = 0.30$$

or whether one adopted the dividend approach:

$$\gamma = F \times \theta = \frac{\text{Credits Distributed}}{\text{Credits Created}} \times \frac{\text{Credits Redeemed}}{\text{Credits Distributed}} = \frac{47}{100} \times \frac{30}{47} = 0.30.$$

[71] Hathaway (2013), Paragraph 99.

118 In its October 2015 Final Decisions, the AER recognised that it must adopt the same estimate of credits distributed in the two places it appears in the above equation.[72] The AER favoured the FAB method and adopted a gamma estimate of 0.31 based on that approach,[73] and would clearly have arrived at the same estimate of gamma if it had used the dividend approach in both places in the above equation.

119 In its most recent decisions, the AER has updated this estimate to 0.34.[74]

120 We note that the Tribunal has concluded, and we agree, that the redemption proportion is at most an upper bound for theta so that:

$$\theta < \frac{\text{Credits Redeemed}}{\text{Credits Distributed}},$$

which implies that $\gamma < 0.34$.

121 Thus, the only point of contention is whether the 0.34 figure should be interpreted as a point estimate or an upper bound. There is no question about the reliability of either of the two terms that are required to estimate it.

122 However, in its most recent decisions, the AER has downplayed the use of ATO tax statistics:

> In this final decision, we consider there are potential underlying data issues with tax statistics and as a result, the utilisation rate cannot be estimated reliably from this data. As outlined by Lally, the data issues with tax statistics are generally accepted by service providers, the Tribunal, Hathaway, NERA, Handley and Frontier. For this reason, in this decision, we have placed limited weight on tax statistics.[75]

123 In this regard, the AER notes that Lally (2016) has restated the issue relating to using the tax data to estimate the amount of distributed credits. Lally (2016) does not present any new evidence, but simply restates the well-known issue in relation to the quantum of credits distributed:

> …variation arising from two possible approaches (ATO dividend data and ATO tax data) whose results should match and the divergence cannot be reconciled. This variation casts doubt on all estimates using ATO data, and this problem with the ATO data alleged by Hathaway is generally accepted.[76]

124 As set out above, the fact that it is generally accepted that there are two different estimates of the amount of credits distributed does not mean that the ATO data should be abandoned entirely. The 0.34 upper bound (which had been used as a point estimate by the AER) does not require an estimate of the amount of credits

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[72] See, for example, SAPN Final Decision, Attachment 4, p. 18.

[73] See, for example, SAPN Final Decision, Attachment 4, p. 18.

[74] AusNet Draft Decision, Attachment 4, p. 16.

[75] Citipower Final Decision, Attachment 4, p. 13.

[76] Lally (2016), p. 20.

distributed. It is a ratio of redeemed credits to created credits, and there has been no question raised about the reliability of either of these quantities.

125 Moreover, the AER has been inconsistent in its treatment of the ATO data. The AER relies on the FAB estimate of credits redeemed when it estimates the distribution rate[77] as $F = \frac{\text{Credits Distributed}}{\text{Credits Created}}$ but it questions the use of that same figure when estimating theta as $\theta = \frac{\text{Credits Redeemed}}{\text{Credits Distributed}}$. Both require the same estimate of credits distributed, so it cannot be that the same figure is reliable in one case and unreliable in the other.

126 In our view, the 0.34 upper bound for gamma is relevant evidence that is unaffected by any concerns about the estimate of the quantum of distributed credits. In our view, the 0.34 figure is a reliable estimate of the upper bound for gamma that is entirely consistent with our preferred point estimate of 0.25 being somewhat below that upper bound. The issues raised by Dr Lally and the AER about the unreliability of tax statistics are not relevant to the calculation of the 0.34 upper bound for gamma. The 0.34 figure is independent of the estimate of the quantum of credits distributed, which is the only figure about which concerns have been raised. Consequently, 0.34 remains a robust upper bound for gamma, against which point estimates can be compared for reasonableness.

[77] Citipower Final Decision, Attachment 4, p. 14; AusNet Draft Decision, Attachment 4, p. 11.

7 AER issues with dividend drop-off analysis

127 In its recent decisions, the AER sets out what it considers to be a number of limitations relating to dividend drop-off analysis.[78] This list of limitations was first raised by the AER during the Guideline process and again in its November 2014 draft decisions. My previous report, SFG (2015, pp. 38-39),[79] provides responses to these issues and provides references to where responses were provided on two previous occasions: as part of the Guideline process and prior to the 2014 draft decisions.

128 Also, my previous report, SFG (2014, pp. 27-28),[80] summarises the Tribunal's scrutiny of the SFG drop-off study and its adoption of the SFG estimate.

129 In its recent final decisions,[81] the AER summarises some empirical estimation issues in relation to the SFG dividend drop-off analyses. As set out above, these points have been responded to twice before, but I briefly summarise them here:

Possibly implausible estimates

130 The AER again raises the point that it is possible for dividend drop-off analyses to produce implausible estimates. Of course it is possible that any empirical analysis might produce an implausible estimate, particularly if it is a low-quality study that has not been carefully performed and which has not been scrutinised. The AER now accepts that the fact the SFG study produces a stable, precise and plausible estimate means that this criticism is irrelevant.[82]

Drop-off studies measure the market value of credits

131 The AER considers that dividend drop-off studies reflect the actual market value of credits, whereas the AER seeks an estimate of what the value would be in the absence of considerations such as personal taxes and personal costs such that all redeemed credits were valued at the full face amount by the redeeming investor. In our view, the fact that dividend drop-off analysis measures the market value of credits is a great advantage because the approaches that assume that redeemed credits are valued at the full face amount produce nothing more than an upper bound. In this regard, the Tribunal has recently stated that:

> Given that two of the three approaches adopted by the AER are considered no better than upper bounds, it follows that the assessment of theta must rely on market studies. The Tribunal considers that, of the various methodologies for estimating gamma employed by the AER, market value studies are best placed

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[78] AusNet Draft Decision, Attachment 4, p. 173.

[79] SFG, 2015, *Estimating gamma for regulatory purposes*, 6 February.

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

[81] AusNet Draft Decision, Attachment 4, p. 173.

[82] AusNet Draft Decision, Attachment 4, p. 173.

> to capture the considerations that investors make in determining the worth of imputation credits to them.[83]

Dividend drop-off estimates might be affected by trading around the ex-dividend date

132 In its Guideline materials, the AER cites evidence of abnormal trading being associated with an increase (or "run-up") in the cum-dividend price.[84] The AER cites the report that it commissioned from McKenzie and Partington (2011), who survey the relevant research and report that there is:

> Direct evidence of the presence of short term trading about the ex-dividend date in Australia,[85]

and that:

> Short term traders appear to be arbitraging higher yield franked dividends and low spread stocks.[86]

133 They conclude that the result is:

> Buying pressure cum dividend, selling pressure ex dividend, and an abnormal volume of trades. Note however, that these price effects are not just from short term trading.[87]

134 In summary, McKenzie and Partington advise that there is buying pressure from a range of investor types that causes the cum-dividend price to be higher than it would otherwise be (the price run-up) and selling pressure from a range of investor types that causes the ex-dividend price to be lower than it would otherwise be. The result is that the abnormal trading volume causes the dividend drop-off to be *larger* than it would have been if trading among market participants had been at more normal levels. This is illustrated in Figure 3 below.

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[83] *PIAC-Ausgrid*, Paragraph 1096.

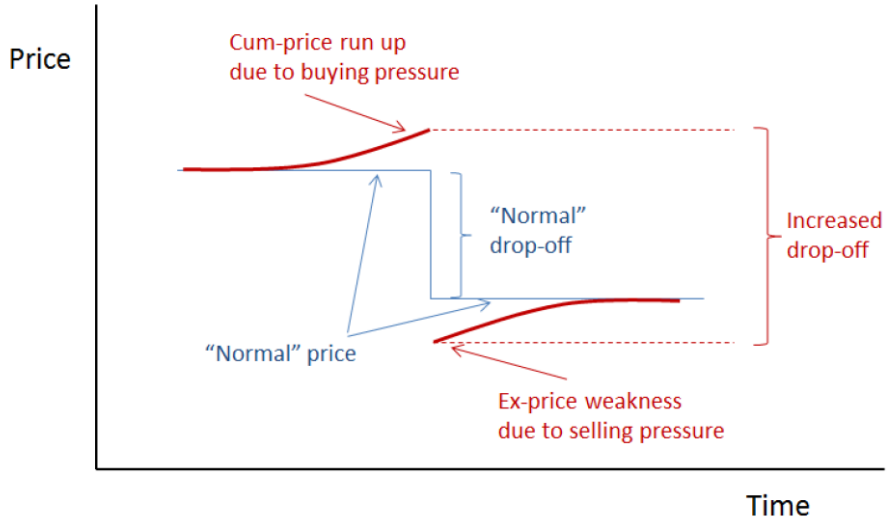
[84] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 170.

[85] McKenzie, M. and G. Partington, 2011, *Report to the AER: The estimation and theory of theta*, March, p. 9.

[86] McKenzie and Partington (2011), p. 10.

[87] McKenzie and Partington (2011), p. 10.

Figure 3: Trading activity and drop-off ratios



135 That is, to the extent that the increased trading around the ex-dividend date (that is identified by McKenzie and Partington) has an impact on the dividend drop-off estimate of theta, it will tend to *inflate* that estimate.

136 In its recent decisions, the AER cites a report by Lally (2013)[88] which pre-dates the Guideline. Lally agrees that the abnormal trading set out above would tend to inflate the estimate of theta but rejects the drop-off estimate on the basis that it does not reflect the complex weighted-average utilisation rate that the AER is seeking to estimate under its conceptual definition of gamma.

137 In our view, these are two separate issues. Conditional on seeking an estimate of the market value of credits, the analysis above suggests that, if anything, trading around the ex-date will tend to inflate the estimate of theta – as that trading may be motivated by traders who value the credits most.

138 The AER's recent decisions also cite a report by SACES (2015)[89] which pre-dates the recent Tribunal decision. SACES conclude that the SFG studies are high-quality and consistent with best practice, but they reject all dividend drop-off analyses on the basis that the traders who are most active around ex-dates may not reflect the broad market. SACES do not address the analysis presented by McKenzie and Partington (2011) or the analysis above which shows that, to the extent that the increased trading around the ex-dividend date has an impact on the dividend drop-off estimate of theta, it will tend to *inflate* that estimate.

139 The AER's recent decisions do not respond to our previous submissions that this trading is, if anything, likely to inflate the estimate of theta. Nor do the AER's recent decisions cite McKenzie and Partington (2011) in this regard.

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[88] AusNet Draft Decision, Attachment 4, p. 174. See Lally, M., 2013, *The estimation of gamma*, November.

[89] AusNet Draft Decision, Attachment 4, p. 175. See SA Centre for Economic Studies, 2015, *Independent estimate of the WACC for SA Power Networks 2015 to 2020: Report commissioned by the SA Council of Social Services*, January.

Dividend drop-off analysis uses a large data set and 'complex' estimation methods

140 The AER's recent decisions follow all of its decisions since the Guideline in noting that the SFG studies use a large data set with many observations.[90] In my view, this is a strong positive as large data sets are more able to provide robust and precise estimates, and can be used to demonstrate the stability of the estimate over time.

141 The AER's recent decisions also follow its previous decisions in commenting on the 'complexity' of dividend drop-off analysis.[91] However, the methodology applied is regression analysis, which is the same as the AER uses to estimate beta. Moreover, dividend drop-off analysis is a standard empirical approach that has been performed in many empirical studies. We would also make the general point that estimation techniques should be selected primarily on the basis of whether they are appropriate for the task at hand – we should not adopt inappropriate estimation techniques on the basis that they are simple.

The combined value must be allocated between dividend and imputation credits

142 The AER's recent decisions follow all of its decisions since the Guideline in noting that dividend drop-off analysis provides separate estimates of the value of cash dividends and the value of imputation credits.[92] The former is estimated with reference to unfranked dividends and the latter is estimated with reference to franked dividends. In an ideal world, we would have access to traded prices of imputation credits or to stocks that distributed credits in the absence of dividends. However, because such data does not exist, it is necessary to use a mixture of franked and unfranked dividends to separate the value of dividends from the value of imputation credits.

Academic 'concerns' about dividend drop-off analysis.

143 The AER's recent decisions follow all of its decisions since the Guideline in setting out a set of 'academic concerns' with dividend drop-off analysis.[93]

144 The examples provided by the AER fall into two groups:

a. Those expressed by consultants for energy users and the AER; and

b. Those that suggest that dividend drop-off analysis might *overestimate* theta.

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[90] AusNet Draft Decision, Attachment 4, p. 176.

[91] AusNet Draft Decision, Attachment 4, p. 176.

[92] AusNet Draft Decision, Attachment 4, p. 176.

[93] AusNet Draft Decision, Attachment 4, p. 178.

145 Our responses to the concerns that have been expressed and an explanation of why, if anything, dividend drop-off analysis might tend to produce an upwardly conservative estimate of theta are set out above.

146 In this regard, we also note that dividend drop-off analysis is a well-accepted empirical technique that has been refined over time. There are dozens of dividend drop-off analyses that have been published over many years in the world's leading finance journals.

Ainsworth, Partington and Warren (2015)

147 One recent academic paper is Ainsworth, Partington and Warren (2015)[94] who "examine the implications of the imputation system for…cost of capital," among other things. This paper is of particular relevance as it specifically comments on the AER approach to gamma. Ainsworth et al begin by drawing the important distinction between what they call "value in use" and "value in exchange." Specifically, they make the point that just because some investors may receive a benefit at the time they redeem an imputation credit, it does not necessarily follow that credits must have a material effect on traded stock prices or the cost of capital. This is because share prices (and consequently the cost of capital) will be the equilibrium outcome of the complex interaction of trading among all investors, and certain types of investors may be more influential in determining the equilibrium price:

> Also relevant is the basic economic distinction between 'value in use' and 'value in exchange'. There is no doubt that imputation credits have considerable value in use to Australian resident investors, who can use them to reduce taxes. Whether they have value in exchange – in other words, whether they are priced – is a separate matter.[95]

148 Ainsworth, Partington and Warren (2015) also set out the basic economic principle that the fact that an investor receives and redeems an imputation credit does not mean that the investor must value that credit at the full face amount:

> The fact that a domestic investor holds a stock and can fully utilise any imputation credits does not provide incontrovertible evidence that they attribute full value to imputation in exchange. It is entirely possible that a domestic investor could be holding a domestic stock due to expectations of receiving high pre-tax returns or other reasons, and not pricing in the imputation credits in the process. Just because an investor receives imputation credits does not necessarily mean they fully price them, and hence require a commensurately lower pre-imputation return from the company as a consequence.[96]

149 We note that the AER's current approach to gamma is based entirely on the proposition that every domestic investor who receives imputation credits *does* fully

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[94] Ainsworth, A, G. Partington and G. Warren, 2015, "Do franking credits matter?" Research working paper, Centre for International Finance and Regulation.

[95] Ainsworth, Partington and Warren (2015), p. 9.

[96] Ainsworth, Partington and Warren (2015), p. 14, emphasis added.

price every one of them and hence require a commensurately lower pre-imputation return from the company as a consequence.

150 Ainsworth, Partington and Warren (2015) go on to suggest that the relevant consideration is an empirical one – whether stock prices in financial markets are bid up to reflect some value for imputation credits:

> This fundamental issue can be posed as follows. Consider two companies with identical assets, with the exception that one also has a positive balance in its franking account and can distribute imputation credits, while the other has a zero balance. The question is: "Do the two companies sell for the same price?"[97]

151 Ainsworth, Partington and Warren (2015) note that the evidence generally suggests that the two companies above *do* sell for the same price.[98]

152 The fact that share prices might be independent of the amount of imputation credits the firm has available is consistent with the observation that, in practice, firms have little regard to imputation when estimating the cost of capital that they would use when evaluating potential new projects. In this regard, Ainsworth, Partington and Warren (2015) conclude that:

> Removing imputation would probably have no major impact on the manner in which most companies estimate cost of capital and evaluate investments. Imputation is typically *not* built into the cost of capital for most companies.[99]

153 Ainsworth, Partington and Warren (2015) give special consideration to the regulatory approach to lowering allowed returns to reflect the assumed effect of imputation credits on the corporate cost of capital. They note that this approach is very different from the commercial practice of making no adjustments at all to corporate valuation or cost of capital estimates in relation to imputation:

> The treatment of imputation credits for regulatory purposes stands in stark contrast to the approach elsewhere. Regulators make explicit allowance for imputation in their regulatory decisions (e.g. see AER, 2015). The regulators employ the model of Officer (1994), where imputation is taken into account and other tax effects incurred by investors are ignored. The application involves reducing the cost of corporate tax by the 'value of imputation credits', which lowers the pre-tax return that utilities are allowed to earn on regulatory capital. This has the effect of limiting the prices that utilities are permitted to charge.[100]

154 They go on to summarise the AER's recent approach as follows:

> The regulators estimate the value of imputation credits as the product of the distribution rate (i.e. the portion of income that is assumed to be distributed to shareholders), and the utilisation rate. The latter parameter reflects an estimate of the value of imputation credits in the hands of investors. In a recent decision, the Australian Energy Regulator (AER) applied a value of 0.4 to imputation credits (AER, 2015). While this value was formed with reference to a range of

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[97] Ainsworth, Partington and Warren (2015), p. 9.

[98] Ainsworth, Partington and Warren (2015), p. 17.

[99] Ainsworth, Partington and Warren (2015), p. 27.

[100] Ainsworth, Partington and Warren (2015), p. 27, emphasis added.

> estimates and measures, it roughly equates to the product of a 70% distribution rate and a 60% utilisation rate. That is, regulatory practice assumes that distributed imputation credits are worth about $0.60 in the dollar.
>
> A notable feature of the regulatory approach is the hierarchy that is applied in considering various estimates of the utilisation rate. The AER firstly relies on the proportion of Australian equities holdings held by domestic investors, which it indicates to be in the range of 0.56 to 0.68 for all equity, and 0.38 to 0.55 for listed companies. They secondly consider the reported utilisation of imputation credits according to taxation statistics, suggesting a range for the utilisation rate for all equity of 0.4 to 0.6, with reference to analysis by Hathaway (2013). They place least reliance on what they call 'implied market value studies'. Thus least weight is placed on the body of research aiming to extract the value of imputation credits from market prices and returns, as described in Section 4.1. Their reasons are that the equity holding and tax data provide more direct and simple evidence, meanwhile downplaying market-based studies based on their methodological limitations and variable estimates.[101]

155 Ainsworth, Partington and Warren (2015) then call into question the basis of the AER's approach, in the context of their discussion about the standard economic concept of market equilibrium:

> The discussion in Section 3.2 around how market equilibrium is determined is directly relevant to this issue. It raises some questions over the philosophy underpinning the regulatory approach.[102]

156 They further spell out the problems with the AER's approach. They note that investors will consider many factors when determining what assets they will purchase and what price they would be prepared to pay for them. This prevents problems for the AER's "aggregation" approach, which simply counts up the number of credits that are distributed to domestic investors and *assumes* that those investors value all credits at the full face amount *and* that this is reflected in the equilibrium share price and cost of capital:

> In practice, an investor's demand for assets may reflect a whole range of considerations, including their expectations, the broader portfolio context, their liabilities, constraints, other costs, etc. This issue is particularly problematic for applying the aggregation approach through reference to observed holdings.[103]

157 In my view, Ainsworth, Partington and Warren (2015) reinforce the view that the AER's approach of simply counting up the number of credits that might be distributed to domestic investors has no proper basis to it and is inconsistent with standard economic concepts of equilibrium and with standard commercial practice.

158 In response to the concerns that are expressed in this paper, the AER has concluded that:

> …while the paper raises a number of points highlighted by Gray (for Frontier), we do not consider the paper provides evidence that the equity ownership

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[101] Ainsworth, Partington and Warren (2015), p. 27.

[102] Ainsworth, Partington and Warren (2015), Footnote 21, p. 27, emphasis added.

[103] Ainsworth, Partington and Warren (2015), p. 14, emphasis added.

> approach that uses the aggregation approach to estimate the value of theta is not reasonable.[104]

159 The AER then cites a passage from Ainsworth, Partington and Warren (2015) that summarises a number of dividend drop-off estimates and other market value studies and notes that the average estimated value of distributed credits (theta) is 0.38,[105] which is of course very close to our own preferred dividend drop-off estimate of 0.35.

160 In our view, a paper that "raises some questions over the philosophy underpinning the regulatory approach",[106] concludes that there are issues that are "particularly problematic" [107] for the regulatory approach, and which reports an average theta estimate over a number of studies of 0.38 is very much consistent with what we have proposed in relation to the estimation of gamma and quite inconsistent with the AER's approach and estimates.

[104] AusNet Draft Decision, Attachment 4, p. 95.

[105] AusNet Draft Decision, Attachment 4, p. 96.

[106] Ainsworth, Partington and Warren (2015), Footnote 21, p. 27, emphasis added.

[107] Ainsworth, Partington and Warren (2015), p. 14, emphasis added.

8 Specific issues raised by Lally (2016)

8.1 Conversion of market value estimates into redemption proportion estimates

161 In its decisions since the Guideline, the AER has maintained that theta should not be estimated as the market value of distributed credits but as the proportion of credits that might be redeemed. The AER's view is that since dividend drop-off analysis estimates the market value of credits, there must be an adjustment to convert those estimates to the correct 'pre-personal cost and tax' basis. In its recent decisions, the AER maintains this view.[108]

162 Our view remains that theta should be interpreted as the value (as in 'worth') of distributed credits, and consequently no such adjustment is relevant. Dividend drop-off analysis provides a direct estimate of the extent to which credits are capitalised into stock prices. Since drop-off analysis already estimates the market value of distributed credits, no adjustment required. The Tribunal concurs with our view that theta should be interpreted as the market value of distributed credits and with our view that no adjustment is required.[109]

163 We have previously provided two other reasons why any such adjustment should not be made, as set out below.[110]

The proposed adjustment produces perverse outcomes

164 First note that the proposed adjustment is to divide theta by the estimated value of cash dividends, which can be defined as δ. Suppose the regulator applies the scaling approach, but that the dividend drop-off analysis suggests that $\delta = 1$, so that the scaling has no effect. The regulator then determines the allowed revenue for the firm of say \$X.

165 Now consider a case that is identical in all respects to the one above, except that the drop-off analysis produces an estimate of $\delta < 1$. In this case, *everything* is identical to the previous case, except that shareholders do not value dividends as highly. If anything, this should require an *increase* in the allowed revenues – because shareholders do not value dividends as highly, they would need to receive more of them in order to be left equally well off.[111] However, under Dr Lally's proposed approach the drop-off estimate of theta would be increased (by dividing by $\delta < 1$) which would in turn result in *lower* allowed revenues.

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[108] Citipower Final Decision, Attachment 4, Appendix 15.

[109] *PIAC-Ausgrid*, Paragraph 1103.

[110] SFG, 2015, *Estimating gamma for regulatory purposes*, 6 February, p. 40.

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

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

The proposed adjustment would need to apply throughout the regulatory process

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

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

8.2 The interpretation of "value"

169 Lally (2016) begins by discussing the basis of his report. He notes that the Rules state that "gamma is the value of imputation credits" and goes on to conclude that:

> By implication, θ must be the value per $1 of distributed credits. However, consistent with finance involving considerable recourse to mathematical formulas, the word "value" in a valuation model is capable of meaning the "numerical level" of a parameter. This has no particular market value connotations.[112]

170 That is, Lally (2016) interprets the "value" of theta as meaning the "numerical level" of theta rather than any concept that relates to the worth of credits to investors. In this case, the reference to "value" in the Rules would not constrain the approach to theta in any way – because the regulator will always set theta to *some* number.

171 As set out in Sections 2 and 3 above, our view is that Lally (2016) has embarked on the wrong task from the outset. If the regulator reduces the allowed return to investors by anything other than the value (as in 'worth') of credits, investors will not be properly compensated.

172 In its recent decisions, the AER has stated that:

[112] Lally (2016), p. 7.

> …nowhere in this final decision or in our prior decisions do we seek to support any aspect of our position with 'specific reference to "value" in the Rules in that it is "the number that is adopted" for imputation credits'.[113]

173 Rather, the AER interprets "value" as:

> ,,,the pre-personal tax and pre-personal cost value[114]

which is interpreted as the face amount of the credits. This is the "value" that investors would assign to credits in the absence of all of the reasons why they actually value credits at less than the full face amount.

174 Thus, there are three alternative interpretations of "the value of imputation credits":

a. We interpret "value" in the standard way – as in the worth of credits to investors;

b. The AER recognises that what it calls personal taxes and personal costs will result in credits having a worth to investors that is less than the face amount. The AER's interpretation of "value" is what the worth of these credits would be to investors before investors consider how personal taxes and personal costs may affect the actual worth of credits to them; and

c. Lally is of the view that "value" should be interpreted as meaning "the numerical level" of a parameter.

175 As set out in Section 4 above, our view is that there are compelling reasons to interpret "value" in the standard way, as in the worth of credits to investors – most notably because that is the approach that is adopted for every other WACC parameter.

176 Finally, we note that there is a clear difference between the AER and Lally (2016) interpretations of "value." It is unclear to us whether and how this difference in the interpretation of "value" affects the estimation methods and estimates that have been proposed, and the extent to which it is safe for the AER to rely on the Lally (2016) advice on "the value of imputation credits."

8.3 Equilibrium asset pricing models

177 In this section, we provide more detail on issues relating to the derivation and use of the complex weighted-average utilization rate from asset pricing models such as Monkhouse (1993)[115] and Lally and van Zijl (2003).[116]

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[113] Citipower Final Decision, Attachment 4, p. 82.

[114] See, for example, Citipower Final Decision, Attachment 4, p. 23.

[115] Monkhouse, P. H. L., "The cost of equity under the Australian dividend imputation system, *Accounting and Finance,* 33, 1-18.

[116] Lally, M. and T. van Zijl, 2003, "Capital gains tax and the capital asset pricing model," *Accounting and Finance,* 43, 187-210.

Basis of the models

178 We begin with what we consider to be two entirely uncontroversial propositions in relation to any CAPM equilibrium:

a. Investors seek to maximise utility over their portfolios (i.e., each investor constructs an investment portfolio that has the optimal risk/return properties for them); and

b. Investors cannot own assets that are not in the market portfolio.

179 For example, these two points are made very clear by Monkhouse (1993):

a. Equation 4.5[117] states that every investor will maximise their utility over their entire portfolio; and

b. Section 5, titled "Market Equilibrium" shows that, for the market to clear, the *i* investors must collectively own the *j* assets and nothing else.

180 Lally (2016) refers to the derivations of Monkhouse (1993) and Lally and van Zijl (2003) and concludes that:

> …theta is a weighted average over the utilization rates for imputation credits by individual investors…So, theta is not the market value of the credits.[118]

181 Under the assumptions of these models, the value of credits that is reflected in the stock price would be a weighted-average utilization rate (where the weights depend upon the wealth and risk aversion of each investor).

The theoretical value vs. the real-world value

182 In reality, the actual market value of credits (reflected in the actual stock price) may differ from what a model might suggest. This may occur, for example, because some of the simplifying assumptions of the model do not hold in reality. In this case, the market value would differ from the weighted-average utilization rate.

183 What we understand Lally (2016) to mean is that he is seeking to estimate the complex weighted-average utilization rate – to be consistent with the theoretical model – but the actual value of credits in the real-world market may differ from the complex weighted average. In such a case, we understand that Lally would reject the market value and seek an alternative way to estimate the complex weighted-average.

184 That is, we understand Lally (2016) to be seeking an estimate of what the value of credits *would be* under the simplifying assumptions of the models. However, the market value provides an estimate of what the value of the credits actually *is* in reality – and would be irrelevant for that reason.

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[117] Monkhouse (1993), p. 10.

[118] Lally (2016), p. 3.

185 However, our view is that it is the actual real-world market value and not the theoretical complex weighted-average that the regulator should be seeking to estimate. There are two reasons for this:

a. The regulator will reduce the allowed return to investors according to the regulator's estimate of gamma. If the regulator estimates the theoretical complex weighted average and the real-world value of the credits to investors is lower, the investors will be left undercompensated.

b. It is the real-world market value that forms the basis of other WACC parameters, and more generally when estimating parameters of any asset pricing model. For example, it is standard practice to estimate the risk-free rate from the actual market price of government bonds – we do not undertake an exercise to estimate what the price of the bonds would be if the assumptions of the CAPM (e.g., no taxes or transactions costs) were true. Similarly, MRP and beta are estimated from actual stock prices – there is no adjustment or alternative methods for estimating what these parameters *would be* if the simplifying assumptions of the model were strictly true.

186 Thus, in our view, this discussion should end here. The appropriate task for the regulator is to estimate the actual real-world value of the credits using market prices – in the same way that every other WACC parameter is estimated. However, for completeness, we consider how one could go about estimating the theoretical complex weighted-average if this is the task that is to be pursued.

Estimating the complex weighted-average in practice

187 In practice, estimating the weighted-average utilisation rate is impossible because it would require information about the wealth and risk aversion of all investors in the market. Consequently, it is necessary to make additional simplifying assumptions before one can even embark on the task of estimating the weighted-average.

188 One approach is to assume that all investors can fully utilise all credits. In this case, the weighted-average utilization rate is simply 1, by this assumption. That is the approach adopted by Lally and van Zijl (2003), who state that they:

> …assume that national share markets are fully segmented. Consequently the utilisation rate should be 1 other than for the market weight of Australian investors unable to use the credits,[119]

and:

[119] Lally and van Zijl (2003), p. 197.

> Since national capital markets are assumed to be segregated, it would be inconsistent to recognise foreign investors. Accordingly, we omit them from consideration.[120]

189 Dr Lally has advised the AER that his preferred approach is to apply this additional assumption and to set theta to 1.[121] However, foreign investors clearly do exist, so simply assuming them away is unhelpful. Moreover, this approach has been consistently rejected by all Australian regulators.

190 An alternative is the approach first recommended to the AER by Handley (2008).[122] Under that approach, the additional assumptions to be applied to the model are:

a. Every credit that is redeemed has a value (to the investor who redeems it) equal to the full face amount;

b. All investors are equally risk-averse; and

c. All investors (domestic and foreign) have no wealth other than that which they invest in Australia, or alternatively that investors ignore the wealth that they have outside Australia when making their Australian investments.

191 These assumptions dramatically simplify the complex weighted-average from the expressions set out in Monkhouse (1993) and Lally and van Zijl (2003). Under these assumptions, the weighted-average can simply be taken over the wealth that investors have invested in Australia – because risk-aversion is the same for all investors and wealth invested outside Australia is either non-existent or irrelevant.

192 However, as well as being implausible and inconsistent with common sense, the assumption about wealth invested outside Australia being either non-existent or irrelevant contradicts the very basis of the models that it seeks to modify because it suggests that investors do not maximise utility over their whole investment portfolios, but only over the subset that is invested in Australia. This is clearly inconsistent with the starting point of the derivation of the model, which requires that investors maximise utility over their entire portfolio[123] and with the market clearing condition that requires that the investors in the market must collectively own the assets in the market and nothing else.[124]

193 Lally (2013)[125] has previously identified the inconsistency that arises when investors are assumed to behave in one way when deriving a model and then in a very different way when modifying the model so that it can be estimated:

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[120] Lally and van Zijl (2003), pp. 197-198.

[121] See, for example, Citipower Final Decision, Attachment 4, p. 172.

[122] Handley, J., 2008, "A note on the value of imputation credits," report for the AER, December.

[123] See, for example, Monkhouse (1993), Equation 4.5, p. 10.

[124] See, for example, Monkhouse (1993), Section 5.

[125] Lally, M., 2013, *The estimation of gamma*, Report for the AER, 23 November.

> 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.[126]

194 That is, Lally (2013) has advised the AER that the Handley approach of simply ignoring any wealth that an investor has outside Australia is either non-existent or irrelevant is wrong. However, that is precisely what the AER does:

> …we consider that the defined market is an Australian domestic market that recognises the presence of foreign investors to the extent that they invest in the Australian market,[127]

and that approach is the basis for the AER's equity ownership estimation method.

Conclusions on asset pricing models

195 In summary, it is impossible to estimate the theoretical complex weighted-average utilization rate without some additional simplifying assumptions. Two proposals have been advanced, and our view is that neither is acceptable:

a. We could assume that foreign investors do not exist; or

b. We could assume that no investors have any wealth other than that which they invest in Australia (or at least that they behave as though that were the case).

196 Lally (2016) confirms his earlier advice to the AER that the former assumption should be preferred.[128] However, he recognises that the AER has rejected his preferred approach in favour of the second assumption above and he goes on to provide advice "conditional on this view being correct."[129]

197 However, our view is that both of the additional assumptions set out above are implausible and both will lead to an over-statement of the actual value of credits to investors. For the reasons set out above, our preferred approach would be for the regulator to reduce the allowed return to investors in relation to imputation

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[126] Lally (2013), pp. 14-15.

[127] Citipower Final Decision, Attachment 4, p. 20.

[128] Lally (2016), p. 17.

[129] Lally (2016), p. 17.

credits according to an estimate of the actual value that investors receive from those credits.

8.4 The use of dividend drop-off analysis to estimate the utilisation rate

198 We note that the key papers that the AER cites as supporting its approach to estimating theta all recognise that dividend drop-off analysis can be used to estimate theta:

a. Monkhouse (1996) recommends that theta should be estimated using dividend drop-off analysis.[130]

b. Lally and van Zijl (1993) state that theta (for which they use the symbol "U") is commonly estimated using dividend drop-off analysis and they cite four drop-off analyses in this regard,[131] although they go on to state that they prefer to set theta to 1 on the basis that foreign investors are assumed away. That is, but for the assumed value of 1, dividend drop-off analysis is the only estimation technique discussed by Lally and van Zijl.

c. Officer (1994)[132] recommends that theta should be estimated using dividend drop-off analysis:

> 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.[133]

d. McKenzie and Partington (2013)[134] note that the redemption rate interpretation of theta is contrary to the accepted practice of adopting a value interpretation of theta, and they go on to follow the accepted practice. In particular, they consider 15 market value studies, four of which involve Associate Professor Partington himself.

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[130] Monkhouse, P., 1996, "The valuation of projects under the dividend imputation tax system," *Accounting and Finance*, 36, 185-212 at p. 205.

[131] Lally and van Zijl (2003), pp. 196-197.

[132] Officer, R., 1994, "The Cost of Capital of a Company under an Imputation Tax System," *Accounting and Finance*, 34, 1-17.

[133] Officer (1994), p. 4.

[134] McKenzie, M. and G. Partington, 2013, "Review of Aurizon Network's draft access undertaking," Report for the Queensland Resources Council, 5 October.

9 Issues arising from the merits review hearings of the Victorian distribution businesses

199 This appendix addresses two issues that arose during the recent merits review hearings sought by the Victorian electricity distribution businesses.

9.1 The complex weighted-average investor and the marginal investor

9.1.1 Overview

200 In October 2016, the Australian Competition Tribunal (Tribunal) handed down its *SAPN* decision.[135] When considering the AER's approach to estimating gamma, the Tribunal characterised the issue as a choice between an "average investor" perspective and a "marginal investor" perspective. However, there are not two different theoretical perspectives or frameworks. Rather, there is a single 'value' of credits and two different ways of assessing that value – via theoretical assumptions or via empirical estimation from market data.

201 We explain below that, under certain theoretical asset pricing models, the value of imputation credits that is reflected in stock prices will be a complex weighted average (by investor wealth and risk aversion) of the ability of each investor to utilise imputation credits. Under the assumptions of the theoretical representative investor models, there would be an equivalence between the complex weighted-average and the observed market price.

202 However, in practice, estimates of the market value differ from the AER's estimates of the average utilisation rate. We explain below that this is because (a) the assumptions of the theoretical model do not hold in practice, and (b) in any event, the AER estimates a simple average of utilisation rates rather than the complex weighted average that is required by those models.

203 Thus, there is not a choice between theoretical "average investor" and "marginal investor" perspectives. Rather, the choice is between:

a. An estimate of what the value of credits *would have been* if the assumptions of the theoretical model *did* hold in the real world, and if the simple average *was* the same as the complex weighted average; or

b. An estimate of the market value of credits, which reflects the outworking of the process by which a market-clearing price is

[135] *Application by SA Power Networks* [2016] ACompT11.

obtained, even where that process is too complex to be captured by a simple economic model.

9.1.2 Representative investor asset pricing models

204 Throughout its Guideline materials, the AER refers to a "complex weighted-average investor" or "representative investor." These terms are drawn from the academic literature on representative investor asset pricing models, one example of which is the Sharpe-Lintner Capital Asset Pricing Model. Under these models, all investors are endowed with some initial wealth and they trade with each other until an equilibrium is reached. The equilibrium price of each asset in the market will reflect the demand for that asset by each investor. How much of an asset an investor might demand will be a function of that investor's wealth and risk aversion. Other things equal, wealthier investors will have a higher demand for all assets and less risk-averse investors will have a higher demand for risky assets.

205 Under these models, the equilibrium price of each asset will reflect a weighted average over all investors – where the weights reflect investor wealth and risk aversion. The AER makes this point in its Guideline materials:

> The representative investor is a weighted average of investors in the defined market. Specifically, investors are weighted by their value weight (equity ownership) [wealth] and their risk aversion.[136]

206 In the remainder of this section, we set out a simple stylised example to illustrate how the equilibrium market price is set collectively by all investors in the market and how the equilibrium price is ultimately determined by the complex weighted average or "representative" investor, and we consider the application to the estimation of the value of imputation credits in the regulatory process.

9.1.3 A simple numerical example

207 Consider a simple economy in which there are two investors (A and B) who are endowed with some initial wealth which they allocate between two risky assets (1 and 2). Suppose that:

a. Both companies have 100 shares outstanding (which is the supply side of the equilibrium); and

b. Investors A and B have \$100 of wealth and \$50 of wealth, respectively.

208 Now suppose that a price is announced for each asset and each investor indicates how many shares they would like to buy at that price. The prices for assets 1 and 2 are announced at \$1.00 and \$0.50, respectively, and the demands from each investor are as follows:

[136] AER Rate of Return Guideline, Explanatory Statement, pp. 119-120.

	Asset A	Asset B	Total Cost
Announced price per share	$1.00	$0.50	
Demand from investor 1	93	14	$100
Demand from investor 2	20	60	$50
Total demand	113	74	$150

209 Note that each investor divides their total wealth between the two assets. For example, investor 1 plans to buy 93 shares of A at $1.00 each and 14 shares of B at $0.50 each, spending his total wealth of $100. Similarly for investor 2.

210 This is not an equilibrium – there are 100 shares of each asset to be sold, so there is excess demand for asset A and not enough demand for asset B. Therefore the price of A must increase (to make it slightly less attractive) and the price of B must decrease, resulting in revised demand from each investor as follows:

	Asset A	Asset B	Total Cost
Announced price per share	$1.10	$0.40	
Demand from Investor 1	83	22	$100
Demand from Investor 2	17	78	$50
Total demand	100	100	$150

211 At these new prices, the market *is* in equilibrium. The aggregate demand matches the total supply of 100 shares for each asset. This shows that both investors have influenced the equilibrium price.

212 Note that in the first (disequilibrium) case, investor 1 wanted to invest 93% of his wealth into asset A ($93 out of $100) and investor 2 wanted to invest 40% of his wealth into asset A ($20 out of $50). Note also that investor 1 has 67% of total wealth ($100) and investor 2 has 33% of total wealth. Thus, the weighted average investor wants to invest 75% of his wealth into asset A (0.67×93% + 0.33×40%). Since total wealth is $150, 75% amounts to $113, which is 113 shares if the price is set to $1.00 – so the market is not in equilibrium, because the total supply is only 100.

213 In the equilibrium case, the weighted average investor wants to invest 73% of his wealth into asset A (0.67×91% + 0.33×37%). Since total wealth is $150, 73% amounts to $110 – which is 100 shares if the price is set to $1.10 – the market is in equilibrium because the weighted-average investor demands exactly the right number of shares. The weighted average investor seeks to invest $110 into asset A, which equates to 100 shares at $1.10 each.

214 Note that this example simplifies things by weighting only on wealth. Risk aversion is relevant in determining why, when the price went up from $1.00 to $1.10, did Investor 1 change demand from 93 to 83 (rather than, say, 82 or 84). This change

depends on that investor's risk aversion via a mathematical equation known as the investor's "utility function". Incorporating utility functions into the above example would add considerable complexity, however the intuition for how risk aversion affects the analysis can be conveyed with the following simple extension.

215 Suppose that, in addition to the two risky assets (A and B) there is also a risk-free asset. Suppose investor A has $200 wealth, invests $100 in the risk-free asset and the remaining $100 as set out in the table above. Suppose that investor B has $50 of wealth and invests none of it in the risk-free asset, just mimicking the investments in the table above. That is, investor A is more risk averse than investor B, so invests more into the risk-free asset. This situation is summarised in the table below.

	Asset A	Asset B	Risk-free asset	Total Cost
Announced price per share	$1.10	$0.40		
Demand from Investor 1	83	22	$100	$200
Demand from Investor 2	17	78	$0	$50
Total demand	100	100	$100	$250

216 In this case, the weighted-average is taken by weighting by total wealth *and* the proportion of that wealth that the investor elects to invest in the risky assets (the second component being a measure of risk aversion). Thus, the weighted-average in the equilibrium case above is that the weighted average investor wants to invest 44% of his total wealth into asset A, computed as:

$$0.80\times0.5\times91\% + 0.20\times1.0\times37\% = 44\%.$$

217 Investor 1 has 80% of the total wealth ($200 vs $50) and places 50% of it into the risky assets with 91% of the investment in risky assets going to asset A.

218 Investor 2 has 20% of total wealth, invests all of it into risky assets with 37% of it going to asset A.

219 In this example, total wealth is $250, so the weighted average investor (weighted by wealth and a measure of risk aversion) seeks to invest $110 (44%) into asset A.

220 This example shows that both investors have influenced the equilibrium price according to their wealth and risk aversion. If either investor had a different level of wealth or a different degree of risk aversion, the equilibrium outcome would have been different. Ultimately, the equilibrium price of the shares was set so that the aggregate demand for shares (by investors in the market) was equal to the supply of shares in the market.

9.1.4 The marginal investor perspective

221 The concept of a "marginal investor" becomes relevant when trade occurs. Suppose that investor 1 seeks to increase his holding in Asset A by five shares (e.g., because he has received a pay rise), and that investor 2 agrees to sell him those shares for $1.12 each. Both investors consider that this trade makes them better off, so the trade occurs and the market price is recorded as $1.12, this being the new equilibrium value of the asset.

222 What we know from this is that investor 1 values those shares at *at least* $1.12 and investor 2 values then at *at most* $1.12. Thus, there are two marginal investors (a buyer and a seller) who may assign different values to the shares.

223 The observed market price is not some 'marginal investor' theoretical construct, it is simply the observed market price. It reflects the equilibrium value of an asset. If the market valued the asset higher, trading would continue and the price would rise, and vice versa. The observed price at a point in time reflects the market equilibrium valuation at that point in time.

9.1.5 Two different perspectives?

224 Whenever a market price is observed, it can be said to have been produced by a trade between two 'marginal investors' – a buyer and a seller. Thus, the 'marginal investor' perspective is nothing more than the use of observed market prices.

225 Under the assumptions of the theoretical representative investor models, the observed equilibrium price of an asset in the market would be set by the complex weighted-average investor. There would be an equivalence between the complex weighted-average and the observed market price.

9.1.6 Application to the regulatory estimate of gamma

226 The same complex weighted-average approach can be used to model the equilibrium 'price' or 'value' of imputation credits. Theoretical papers such as Monkhouse (1993) and Lally and van Zijl (2003) show that, under the assumptions of those models, the value of imputation credits that will be reflected in the equilibrium stock price is the complex weighted-average (by wealth and risk aversion) of the extent to which each investor is able to utilise/redeem the credits that they receive.

227 In a world that complied precisely with the assumptions that underpin the derivation of the complex weighted average (or "representative") investor, the observed market price (in equilibrium) would be the same as the outcome of the model. This would only occur if all of the assumptions held in the real world. If that were the case, the market price would be the same as the price paid by the marginal investor which would be the same as the price paid by the complex weighted-average investor.

228 However, the models that suggest that theta can be conceptualised as a complex weighted average over investors do not apply in the case where there are TWO markets – a domestic market with some domestic investors and some domestic assets and a foreign market with foreign investors and foreign assets. Those models

derive the equilibrium price by equating demand and supply across THE market, as in the example above.

229 Those models are, however, useful in identifying that the required return on equity must be adjusted by the value of imputation credits, gamma, but they do not imply that the available real-world estimate of the market value of credits should be discarded in favour of a theoretical conceptualisation.

230 Similarly, the CAPM identifies that the required return on equity is a function of the beta and MRP parameters. Having identified the relevant parameters and their role in determining the required return, market prices are then used to estimate them. For example:

a. The CAPM assumes that there are no taxes or transactions costs, but the MRP is estimated from market prices that do reflect investors' consideration of those things – the MRP is not estimated as it would have been if the theoretical assumptions actually did hold in the real world; and

b. The Black CAPM evidence suggests that the real-world relationship between beta and returns is somewhat different from the theoretical relationship under the CAPM. The AER's approach is to adjust its beta estimate to accommodate this evidence from market prices – not to impose the theoretical relationship.

231 That is, where real world market evidence is available it is used – it is not supplanted by estimates of what the parameter *would have been* if the theoretical assumptions actually did hold in the real world.

232 In any event, the "complex weighted-average investor" is not the same as the "equity ownership approach", and is not the same as the "tax statistics" approach. These two estimation approaches take a simple average of utilisation rates. This is not a derivation of how the complex weighted average investor would value the asset in question. The simple average is not the same as the complex weighted average because:

a. it ignores risk aversion entirely;

b. it ignores all investor wealth outside Australian shares; and

c. it ignores the fact that the weighted average investor can only be derived in the case of a single market.

233 Thus, there should be no surprise that there is a difference between the estimated market value of imputation credits and the simple average utilisation rate estimates that the AER has adopted. Differences will arise between those two estimates because:

a. The complex weighted-average would only equal the market value under the theoretical assumptions of the model that derives that complex weighted-average. The key assumption that there is a single market where an equilibrium can be derived by equating

demand and supply within the market does not hold in the real world; and

b. In any event, the AER is unable to estimate the complex weighted-average, so it estimates the simple average instead.

234 Consequently, the regulator is left with two estimates – an estimate of the value of imputation credits in the market and an estimate of the simple average utilisation rate. Thus, the regulator must choose between:

a. An estimate of what the value of credits *would have been* if the assumptions of the theoretical model *did* hold in the real world, and if the simple average *was* the same as the complex weighted average; or

b. An estimate of the market value of credits, which reflects the outworking of the process by which a market-clearing price is obtained, even where that process is too complex to be captured by a simple economic model.

In our view, the market value estimate should be used, reflecting the complex process by which the market-clearing price is determined. This is the same approach that is used to estimate every other WACC parameter.

This conclusion would apply even if the AER proceeds on the basis that prices are ultimately set by a representative investor. This is because the market price embodies the complex weighted-average valuation, irrespective of how complex that might be, whereas the AER's equity ownership and tax statistics estimates do not.

9.2 The role of gamma in the regulatory process

9.2.1 Overview

235 The Australian regulatory framework, as reflected in the AER's Post-tax Regulatory Model (PTRM) requires an estimate of gamma in two steps of the process:

a. The first step is to produce an estimate of the total required return on equity, including the benefits of imputation credits. We refer to this as the "with-imputation" required return on equity.

b. The second step is to remove the assumed value of imputation credits to produce an estimate of the "ex-imputation" required return on equity. This figure then flows into the revenue allowance.

236 In our view it is clear that, in the context of these calculations, gamma must reflect the value of credits – the worth of credits to investors. The reason for this conclusion is two-fold, as set out below.

9.2.2 Grossing-up must reflect market value

237 In the first step above, the AER estimates the total required return on equity using the SL-CAPM. The AER's primary estimate of the MRP is the mean of historical excess returns over various long historical periods beginning in 1883. These estimates take the return on a broad stock market index each year and subtract the risk-free rate that was available to investors in that year.

238 Prior to the introduction of imputation in 1987, the observed stock market return already reflected the total return.[137] However, post-imputation the observed market return is not the total return to equity holders – since it reflects only dividends and capital gains, the estimated value of imputation credits must be added via a process that the AER calls "grossing-up." In our view, this grossing-up must reflect the market value of credits. The stock market index reflects the market value of dividends and capital gains, so the market value of imputation credits must be added to it. Adding anything other than the market value of credits would result in apples being added to oranges, producing a conflation that has no economic meaning.

239 For example, suppose that, prior to imputation, investors required a total return on equity of 8%. We estimate this by observing stock prices in the market, so it reflects the market value of credits.[138]

240 Now suppose imputation begins and the face amount of credits is 2% but their value to investors is 1% (because of personal costs or other value impacts associated with credits).

241 In this case, stock prices would adjust so that the observed return from dividends and capital gains only would be 7%, as investors receive the other 1% of value that they require from the credits. This 7% represents the return that investors would require from dividends and capital gains, conditional on receiving credits with a value of 1%. It is a market value figure for dividends and capital gains that reflects all factors that affect the market value of those things.

242 In order to obtain an average of the total return on equity over the whole period, we would take the pre-1987 figures unadjusted (as they already reflect the total return) and the post-1987 figures would have to be grossed-up by adding 1% to reflect the value that investors obtain from imputation credits. Thus, all of the figures that are being averaged are comparable – they all reflect the total market value return.

243 Clearly, it makes no sense to gross-up the post-1987 data to reflect the face amount of credits (2%). This would involve adding a face amount to a market value which is inconsistent in itself. To then average the resulting figure with the pre-1987

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[137] That is, prior to 1987, shareholders received returns in the form of dividends and capital gains, both of which are reflected in the observed market index.

[138] That is, market prices reflect all considerations that investors make when determining what the share is worth to the.

market returns adds a further inconsistency. Rather, market values must be used throughout this step for it to have any economic meaning at all.

9.2.3 The deduction for the value of imputation credits

244 In the second step above, the PTRM removes the estimated value of imputation credits to produce an estimate of the ex-imputation required return on equity, which then flows into the revenue allowance. This step must also be done on a market value basis. To see why, consider the simple numerical example above where investors require a total return on equity of 8%. If the AER were to deduct the face amount of credits (2%) it would then allow the firm to obtain revenues that were sufficient to pay a 6% return to shareholders. If those shareholders only value the imputation credits they receive at 1%, they will be left under-compensated.

245 The reduction in the allowed return to equity holders must reflect the market value to equity holders of the imputation credits that are the reason for that reduction.

10 Declaration

246 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

11 Appendix: Instructions

TransGrid

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Professor Stephen Gray
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27 January 2017

Dear Stephen

Expert Advice on Rate of Return and Value of Imputation Credits

TransGrid is preparing its revenue proposal for the 2018/19 to 2022/23 regulatory period. To assist TransGrid in the preparation of the proposal, TransGrid seeks advice on the following matters from a suitably qualified expert. The advice should be in the form of an expert report that complies with the Federal Court's Expert Evidence Practice Note GPN-EXPT.

In relation to the estimation of the **market risk premium**, the expert is asked to:

a. Explain where the estimation of the MRP fits within the AER's regulatory framework;

b. Explain the approach to estimating the MRP that the AER set out in its 2013 Rate of Return Guideline;

c. Summarise the evolution of the relevant evidence and empirical estimates since 2013;

d. Explain the implications of applying a constant, or substantially constant, MRP to contemporaneous estimates of the MRP; and

e. Provide a current estimate of the MRP by applying the approach set out in the AER's 2013 Rate of Return Guideline to the updated evidence.

In relation to the estimation of the **equity beta** for the benchmark efficient entity, the expert is asked to:

a. Provide an updated set of estimates of equity beta using the current set of listed comparators that the AER uses to set its primary range for beta;

b. Provide a current set of beta estimates for other listed infrastructure firms that operate in workably competitive markets; and

c. Consider the implications of the updated estimates in (a) and (b) above for the AER's current equity beta allowance of 0.7.

In relation to **low-beta bias**, the expert is asked to:

a. Explain the concept of low-beta bias in the context of the SL-CAPM;

b. Examine the approaches for correcting for low-beta bias;

c. Summarise the evidence about the quantum of low-beta bias; and

d. Provide your opinion about the reasonableness of the AER's approach to correcting for low-beta bias.

In relation to the estimation of **gamma**, the expert is asked to:

a. State their views about whether gamma should be interpreted in terms of the market value of imputation credits or in terms of the proportion of credits that are available to be redeemed;

b. Having regard to the answer to (a) above, provide their opinion about what is the best currently available empirical estimate of gamma and of each component of gamma, the distribution rate and the value of distributed credits, theta;

c. State their views about the econometric issues that the AER has raised and maintained in relation to dividend drop-off analysis; and

d. State their views of the issues raised in the Lally (2016) report commissioned by the AER (Lally, M., 2016, "Gamma and the ACT decision," 23 May).

In relation to **dividend drop-off estimation of gamma**, the expert is asked to:

a. Update the SFG (2013) dividend drop-off analysis to incorporate more recent data. (SFG, 2013, "Updated Dividend drop-off estimate of theta," report for the Energy Networks Association, 7 June).

In relation to **transition arrangements for the allowed return on debt**, the expert is asked to provide a short note in letter form that:

a. Sets out the appropriate economic framework for considering whether a transition period should be used when moving to the trailing average approach to the allowed return on debt; and

b. Apply that framework to the benchmark efficient entity and draw conclusions about the economic rationale for the AER's proposed 10-year transition.

Yours sincerely

Nicola Tully
Manager / Prescribed Revenue and Pricing

12 Appendix: 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

2014 E Yetton Prize for best paper in the Australian Journal of Management, Brailsford, T., S. Gray and S. Treepongkaruna, (2013), "Explaining the bid-ask spread in the foreign exchange market: A test of alternate models."
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)

- Institute of Teaching and Learning Innovation Grant 2016-17, Technology-enhanced Learning Grant ($200,000), with K. Benson, B. Oliver and J. Birt.

- Australian Research Council Linkage Grant, 2008—2010, Managing Asymmetry Risk ($320,000), with T. Brailsford, J.Alcock, and Tactical Global Management.
- Intelligent Grid Cluster, Distributed Energy – CSIRO Energy Transformed Flagship Collaboration Cluster Grant, 2008-2010 ($552,000)
- Australian Research Council Research Infrastructure Block Grant, 2007—2008, Australian Financial Information Database ($279,754).
- Australian Research Council Discovery Grant, 2006—2008, Capital Management in a Stochastic Earnings Environment ($270,000).
- Australian Research Council Discovery Grant, 2005—2007, Australian Cost of Equity.
- Australian Research Council Discovery Grant, 2002—2004, Quantification Issues in Corporate Valuation, the Cost of Capital, and Optimal Capital Structure.
- Australian Research Council Strategic Partnership Grant, 1997—2000, Electricity Contracts and Securities in a Deregulated Market: Valuation and Risk Management for Market Participants.

Current Research Interests

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

Publications

Gray, S. and D. Morrison, (2017), 'Phoenixing at the fulcrum: Less faff, faster forward formulation," *Insolvency Law Journal*, forthcoming.

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Gray, S., I. Harymawan and J. Nowland, (2016), "Political and government connections on corporate boards in Australia: Good for business?" *Australian Journal of Management*, 41, 1, 3-26.

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

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

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

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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

2012 - Present: Director, Children's Hospital Foundation, Queensland.

2002 - Present: Director, Financial Management Association of Australia Ltd.
2003 - 2012: Director, Moreton Bay Boys College Ltd. (Chairman from 2007).
2002 - 2007: External Risk Advisor to Board of Enertrade (Queensland Power Trading Corporation Ltd.)

Consulting

SFG Consulting: 1997-2014.
Frontier Economics: 2014-Present.

Twenty years' experience in consulting to companies, government-owned corporations, government and regulatory agencies. Examples include:

- *Regulatory cost of capital*: Preparation of submissions in regulatory determinations. Clients include all Australian energy transmission and distribution businesses, FOXTEL, Telstra, BBI, ACCC, IPART, ERA.

- *Corporate cost of capital reviews*: Review of cost of capital estimates for project evaluation and impairment testing purposes. Clients include QANTAS, Stanwell Corporation, Ecowise.

- *Executive stock option valuation*: Clients include Collins Foods Group, Ground Probe, Crater Gold Mining, Beach Petroleum.

- *New Project Evaluation*: Assisting companies and GOCs to evaluate proposed new projects. Particular focus is on quantifying risk and uncertainty and presenting possible outcomes in a probabilistic framework. Clients include Queensland Treasury Corporation, Queensland Accommodation Group, Stanwell, EnerTrade.

- *Financial modelling and forecasting*: Clients include ATO (forecasting delinquent payments), ASX (forecasting trading volumes), Compass Resources (integrated mine valuation model).

Retained as a valuation expert in many litigation cases; produced many expert witness reports; appeared in Court for cross examination many times including:

- *Macquarie Generation*: Witness for AGL in competition case.
- *Telstra v. ACCC*: Witness for Telstra in rate of return regulation case.
- *C7 Case*: Witness for PBL, Newscorp, Telstra re valuation of Seven's failed cable TV network.
- *Alcan v. NT Commissioner of Revenue*: Witness for Alcan re valuation of combined bauxite mine and alumina refinery for stamp duty purposes.

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