frontier economics

The role of gamma in the regulatory process

Report prepared for Seqwater | 17 June 2021

Disclaimer

Contents

1 Executive Summary

1.1 Author of report

1. 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 a range of courses in finance, corporate valuation and econometrics. I have published widely in high-level academic journals, and I have more than 20 years of practical finance consulting experience.

2. My teaching, research and consulting experience extends to issues relating to statistical analysis and econometric modelling. I have published widely in the areas of financial econometrics and empirical finance, including papers in relation to the estimation of WACC parameters. I have also prepared numerus reports for firms and regulatory bodies relating to the estimation of regulatory WACC parameters.

3. A copy of my curriculum vitae has been provided with this report.

4. 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 Chapter 11 Part 5 of the Queensland Uniform Civil Procedure Rules 1999. I have read, understood and complied with the Rules.

5. I have been assisted in the preparation of this report by Dinesh Kumareswaran and James Key from Frontier Economics.

1.2 Summary of conclusions

1.2.1 Overview

6. This report makes one key point: Because the QCA's regulatory framework reduces the allowed dividends and capital gains by the estimated value of imputation credits, what is required is an estimate of the exchange rate – the extent to which investors are prepared to forego dividends and capital gains in order to receive imputation credits.

7. A dividend drop-off analysis measures exactly that – the value of credits relative to dividends and capital gains.

8. In other words, what is required is an estimate of the market value of dividend imputation credits – the amount of dividends and capital gains that investors would be prepared to give up to receive a dollar of imputation credits. In my view, the best estimate of the 'market value' gamma is 0.25 – the figure that the AER adopted when it last adopted a market value gamma, and the figure that IPART currently adopts.

9. If the QCA continues to maintain that gamma represents something other than the market value of imputation credits, relative to dividends and capital gains, it should explain to stakeholders why it is proper for gamma to reflect something other than the value of imputation credits relative to the dividends and capital gains that those credits are replacing.

1.2.2 The role of gamma in the regulatory framework

10. The regulatory framework operates in two steps:

    a In the first step, the regulator estimates the total required return on equity. In this report, I use a simple example where the regulated firm has equity of $1,000 in its regulated asset base (RAB) and investors require a return on equity of 7%, in which case investors require a total return (consisting of dividends, capital gains and imputation credits) of $70.

    b In the second step, the regulator deducts the 'value of imputation credits' and sets the allowed revenues so that the firm is able to pay the difference to investors in the form of dividends and imputation credits. For example, if the regulator estimates that the value of imputation credits to investors is $5, it will allow the firm to charge prices sufficient to provide an ex-imputation return on equity (i.e., dividends and capital gains) of $65.

11. That is, gamma plays the role of determining the amount by which the allowed dividends and capital gains will be reduced to reflect the value of the imputation credits that investors will receive. It is a form of relative valuation or an 'exchange rate' – the rate at which investors would forego dividends and capital gains in order to receive imputation credits. Thus, gamma must reflect the value of credits relative to the dividends and capital gains that those credits are replacing.

1.2.3 Two parameters to be estimated

12. In the Australian regulatory setting, there is broad agreement between all regulators and experts 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, or 'theta') is variously defined as "the value of distributed imputation credits" or as "the utilisation rate."

13. 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.

1.2.4 Reasons why imputation credits are less valuable than dividends and capital gains

14. There are a number of reasons why imputation credits are less valuable to investors than the dividends and capital gains that they replace in the regulatory setting, including:

    a Some credits are distributed to non-residents who cannot redeem them and therefore do not value them at all;

    b Some credits are distributed to resident investors who are prevented from redeeming them by the 45-day rule;

    c Some credits are distributed to residents who simply fail to redeem them;

d Investors have to wait longer to receive any benefit from the credits – whereas dividends are available to investors immediately, the investor only receives a benefit from credits when their personal tax return is finalised after the end of the tax year;

e There is a compliance and administration cost involved in tracking and redeeming credits; and

f Resident investors will rationally adjust their portfolios until the last dollar of credits they receive just offsets the cost they bear by concentrating their portfolio into franked dividend paying stocks and away from what would otherwise be optimal. Thus, the net benefit of the redeemed credits would, on average, be approximately half of the face amount.

15. Anything that equally affects the value of imputation credits and the dividends and capital gains that the firm is allowed to provide to its equity holders will have no effect on the relative value between them, and therefore no effect on gamma. For example, resident investors pay personal tax on imputation credits at the same rate as on the dividends they receive from the firm. If this were the only factor to consider, investors would value a dollar of imputation credits equal to a dollar of dividends because the same tax cost would be imposed on both. It is for this reason that the personal taxes that investors pay on credits they receive does not appear in the above list.

1.2.5 Competing approaches for interpreting and estimating gamma

16. Two methods for interpreting and estimating gamma have been proposed in the regulatory setting:

a The **market value approach** posits that gamma should be estimated from the observed prices of traded securities in the same way that other WACC parameters are estimated. This approach produces an estimate of the extent to which investors value credits relative to the dividends and capital gains that those credits will replace. It is an estimate of the amount of dividends and capital gains that investors would be prepared to give up in order to receive a dollar of credits.

b The **redemption or utilisation approach** posits that gamma should be estimated as the proportion of credits that are available for investors to redeem. This approach has no regard to the actual redemption of credits, or to the full list of reasons in Paragraph 14 above for why investors might value credits less than the dividends and capital gains that they are replacing.

17. The distinction between these two approaches may be illustrated using an analogy. Suppose a traveller, by means of an airline loyalty program, has accumulated 10,000 frequent flyer points. The fact that the traveller has 10,000 points available to redeem with their airline, on its own, provides no information on the economic value of those points to the traveller, since each point could be worth $1, $5 or $100. In order to determine the economic value of those points, one needs to know the amount by which the traveller is able to reduce their next fare if those 10,000 points were to be utilised. That, in turn, requires an understanding of the exchange rate between one point and one dollar of fare.

18. The redemption or utilisation rate approach would simply count up the number of frequent flyer points available to the traveller. By contrast, the market value approach would seek to determine the amount by which the traveller may reduce their next fare by redeeming the points accumulated.

1.2.6 Prevailing empirical estimates

19. The empirical finance literature has developed a specific technique for estimating the extent to which investors value imputation credits less than dividends and capital gains. This technique is known as dividend drop-off analysis. The most recent dividend drop-off study is that of Cannavan and Gray (2017),[1] published in a highly-ranked international finance journal. That paper estimates theta to be 0.35 for the Australian market, indicating that the market value of credits that is capitalised into stock prices is materially lower than the full face amount of distributed credits. This figure reflects all of the reasons why imputation credits might be valued by investors less than dividends and capital gains – set out in Paragraph 14 above.

20. By contrast, the QCA currently estimates theta to be 0.55 using a redemption/utilisation approach. This figure reflects only the first item in Paragraph 14a above.

21. In both cases, the estimate of theta must be multiplied by the distribution rate to produce a final estimate of gamma, as explained in Paragraph 12 above.

1.2.7 The QCA currently adopts the redemption/utilisation approach

22. Prior to its 2014 Market Parameters Decision, the QCA adopted the market value approach to determining gamma, including reliance on dividend drop-off estimates.

23. In its 2014 Market Parameters Decision, the QCA changed its approach to adopt the redemption/utilisation approach to gamma. In particular, the QCA estimated theta using an estimate of the proportion of shares in Australian listed companies that are owned by Australian resident investors.[2]

24. In its UT5 Final Decision for Aurizon Network, the QCA maintained the approach set out in the Market Parameters Decision.[3]

1.2.8 The QCA's rationale for adopting a redemption/utilisation approach

25. In its UT5 Final Decision for Aurizon Network, the QCA set out two rationales for its adoption of the redemption/utilisation approach: [4]

    a The Federal Court has held that it is open to the Australian Energy Regulator (AER) to adopt the redemption/utilisation approach; and

    b The redemption/utilisation approach is consistent with rigorous derivations of the Officer (1994) model.[5]

26. In relation to the Federal Court Decision, the Court considered the operation of the particular law under which the AER operates. By contrast, the focus of this report is on the economic role of

[1] Gray, S. and D. Cannavan, (2017), "Dividend drop-off estimates of the value of dividend imputation tax credits," *Pacific Basin Finance Journal*, 43B, 213-226. The Pacific Basin Finance Journal (PBFJ) is an A-ranked international journal on the Australian Business Deans Journal List, the main indicator of journal quality used in Australian business schools. PBFJ has a higher citation rate than other A-ranked finance journals.

[2] QCA, 2014, Market Parameters Decision, Chapter 5.

[3] QCA, 2018, Final Decision: Aurizon Network's 2017 draft access undertaking, Appendix F, pp. 171 and following.

[4] QCA, 2018, Final Decision: Aurizon Network's 2017 draft access undertaking, Appendix F, pp. 171 and following.

[5] Officer, R. R., 1994, The cost of capital of a company under an imputation system, *Accounting and Finance*, 34, 1, 1-17.

gamma and the extent to which different approaches to gamma might result in investors being over- or under-compensated. In relation to the Seqwater determination, the QCA will be more concerned about the proper economic role of gamma, and in identifying the approach that results in investors being properly compensated, than about the operation of the law under which the AER operates. Hence the focus of this report.

27. In relation to mathematical derivations of the Officer model, I note that:

    a The mathematical derivation establishes that, under the assumptions of the model, the market value of imputation credits (i.e., the extent to which imputation credits are capitalised into the stock price) will be equal to a weighted-average of the utilisation rate of each investor[6] in the model (weighted by wealth and risk aversion).

    b Thus, in theory, one would obtain the same figure by using market data to estimate the market value of imputation credits or by using redemption and other data to estimate the weighted-average utilisation rate.

    c A key component of these models is that the weighted-average must be taken using the *total* wealth of each investor. In particular, if foreign investors are included in the model, the *total* wealth of those foreign investors must be used when computing the weighted-average.

    d There is no model, and no mathematical derivation, in which a weighted-average is taken using only the subset of wealth that each investor has invested into the Australian equity market. However, that is the approach that has been adopted by the QCA when it computes a weighted-average based on the wealth that residents and non-residents, respectively, have invested in Australian equities.

    e The mathematical derivation requires the weighted-average utilisation rate to also reflect the risk aversion of each investor. However, the QCA does not include risk aversion in its construction of the weighted-average.

28. In summary, the mathematical derivations establish that, under the assumptions of the model, the market value of credits is equal to the weighted-average utilisation rate (weighted by the total wealth and risk aversion of the investors in the model). In this case, the market value and the appropriate weighted-average would be identical. However, the QCA's approach is to compute a *different* weighted-average utilisation rate – one that does *not* reflect the total wealth *or* the risk aversion of investors.

29. In my view, it is clearly wrong to rely on the mathematical derivation of a model to support the use of a particular version of the weighted-average utilisation rate that does not appear anywhere in any mathematical derivation or in any model.

30. Moreover, the weighted-average utilisation rate will only equal the market value of credits under all of the assumptions of the model. It is entirely plausible that real life is more complex than the setting that is developed under the simplifying assumptions of a particular model. In this case, the question facing the QCA is whether:

    a Dividends and capital gains should be reduced according to the actual market value of imputation credits to investors in real life; or

[6] That is, the extent to which each investor is able to redeem credits. Generally, non-residents and residents who run foul of the 45-day rule are unable to redeem and have a utilisation rate of zero. Eligible resident investors have a utilisation rate of one.

b Dividends and capital gains should be reduced according to the value that credits would have under the simplifying assumptions of a particular model.

31. In my view, the deduction that the regulator makes in relation to imputation credits should be based on the actual value of imputation credits to investors because it is far more likely that:

a The particular model in question is imperfect – being limited by its restrictive assumptions; than

b Real-world investors are collectively systematically mis-valuing imputation credits.

32. But if the regulator determines that it will rely on the weighted-average utilisation rate that appears in the mathematical derivation of a model, it should rely on *that* weighted-average, and not some *other* weighted-average that does not appear in any derivation of any model.

1.2.9 The consequences of adopting the 'wrong' approach in the regulatory setting

33. If a regulator adopts a gamma estimate that differs from the exchange rate that properly reflects how investors value imputation credits relative to the dividends and capital gains they replace, the investors will not receive an appropriate rate of return.

34. In the example above, a regulated firm has equity of $1,000 in its RAB and the regulator has determined that a 7% total return would be appropriate. Thus, investors require $70 to be properly compensated. Now suppose that investors receive credits that they value at $5, but that the regulator make a deduction of $9 in relation to those credits. In this case, the investors would be undercompensated by $4.

1.2.10 Matters for the QCA to address in this determination

The regulatory task in relation to gamma

35. If the QCA considers that it would be appropriate to set gamma to something other than the rate at which investors would forego dividends and capital gains in order to receive imputation credits in the real world, it would be useful to stakeholders for the QCA to explain why it considers that to be the case and how the alternative approach results in investors being properly compensated.

Consistency with dividend drop-off analysis

36. The QCA has previously relied on a formula set out in Lally (2015 QCA)[7] which shows that theta represents the extent to which imputation credits are capitalised into the stock price. That same formula is the basis for dividend drop-off analysis. It would be useful to stakeholders for the QCA to explain:

a Whether it agrees that theta should be interpreted as the extent to which imputation credits are capitalised into the stock price (i.e., whether it agrees with Equation (1) in Lally, 2015 QCA); and

b If so, whether it agrees that dividend drop-off analysis is the econometric estimation of that very equation.

[7] Lally, M., November 2015, Review of Submissions on Gamma, Report for the QCA.

Reliance on mathematical derivation of theoretical models for gamma

37. The QCA adopts a weighted-average utilisation rate wherein the weights (a) reflect only that portion of each investor's wealth that is invested in the Australian market, and (b) have no regard to risk aversion. The QCA claims that this approach is supported by the mathematical derivation of a theoretical model.

38. If the QCA considers that its weighted-average utilisation rate is supported by the mathematical derivation of a model, it should provide a reference to a model wherein the weighted-average uses only that portion of each investor's wealth that is invested in the Australian market and has no regard to the risk aversion of each investor.

39. If the QCA is unable to provide such a reference, it should cease claiming that its approach is so supported.

1.2.11 Conclusion in relation to gamma

40. In my view, what is required is an estimate of the market value of dividend imputation credits – the amount of dividends and capital gains that investors would be prepared to give up to receive a dollar of imputation credits. In my view, the best estimate of the 'market value' gamma is 0.25 – the figure that the AER adopted when it last adopted a market value gamma, and the figure that IPART currently adopts.

2 Market value or Redemption/utilisation rate?

2.1 Two parameters to be estimated

41. In the Australian regulatory setting, there is broad agreement between all regulators and experts 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, or 'theta') is variously defined as "the value of distributed imputation credits" or as "the utilisation rate."

42. 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.

2.2 Interpretation of theta

43. In the Australian regulatory setting, two different interpretations of the second parameter, theta, have been proposed:

    a A **market value** interpretation – the amount of dividends or capital gains that investors in general would be prepared to give up in order to receive a dollar of imputation credits; and

    b A **redemption proportion** interpretation – the proportion of distributed credits that might be redeemed by investors.

44. It logically follows that:

    a If the market value interpretation is adopted, we should use estimation methods that are designed to estimate the market value of credits relative to dividends and capital gains; 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.

45. The evidence demonstrates that estimates of the market value of credits are materially lower than estimates of the proportion of credits that might be redeemed.[8] (Of course, if the two approaches produced similar estimates, there would be no reason for any debate.)

46. It is logical that gamma should be interpreted (and estimated) in a way that is consistent with its role within the regulatory framework.

47. Within the regulatory framework, the role of gamma is straightforward:

[8] As noted in Paragraphs 19 and 20 above, the prevailing estimate of the market value of credits is 35 cents per dollar whereas the QCA estimate of the redemption rate is 55 cents per dollar.

a The regulator first estimates the total amount of dividends and capital gains that would have to be paid to the equity holders each year to provide them with an appropriate return on equity.

b The regulator then estimates the amount by which the allowed dividends and capital gains can be reduced in relation to imputation credits. That is, because investors obtain some value from imputation credits, the allowed dividends and capital gains are reduced.

48. Thus, within the regulatory framework, what is required is an estimate of the extent to which allowed dividends and capital gains can be reduced in relation to each dollar of imputation credits. That is the role of gamma – it is an estimate of the amount of dividends and capital gains that investors would be prepared to give up in order to receive a dollar of imputation credits.

49. The remainder of this section explains, in more detail, that within the regulatory framework, gamma represents the value of imputation credits relative to the dividends and capital gains they are deemed to replace. That is, gamma must be estimated in terms of the market value of credits relative to the allowed dividends and capital gains they are replacing.

2.3 A simple illustration

2.3.1 The value of credits relative to the allowed return on equity

50. To create a simple framework for analysing the key issue of what gamma actually means, I begin with the following analogy.

51. Consider an accountant with a charge-out rate of $70/hr who performs a task that takes exactly one hour. The accountant would then invoice the client for $70. Now suppose that the client is a resident of Malaysia and proposes to pay part of the bill in the form of 30 units of Malaysian currency. In this case, the accountant would note that each unit of Malaysian currency can be converted into 35 Australian cents (after all relevant fees and charges), so the 30 units of Malaysian currency are equivalent in value to AUD $10.50. Thus, the accountant would reduce the required payment of Australian dollars to $59.50. That is, the accountant would be indifferent between receiving $70 or $59.50 plus 30 units of Malaysian currency. Note that this calculation requires an estimate of the value of Malaysian currency relative to Australian dollars – how many Australian dollars would one give up in order to receive one unit of Malaysian currency.

52. Now consider the regulatory setting where a business has $1,000 of equity capital. Suppose that investors require a return on equity of 7%. In this case, the business would be allowed to charge prices so that it was able to provide a $70 return on equity (dividends and capital gains) to its shareholders.

53. Now suppose that the firm's shareholders will also be provided with $30 (face amount) of imputation credits. Under the regulatory framework, the allowed revenues will be reduced by the 'value' of those credits. This means that the allowed return on equity provided to the shareholders will be reduced by the estimated value of the credits. Thus, what is required is an estimate of the relative value of imputation credits to the allowed return on equity. For example, if investors in aggregate value the receipt of a dollar of credits equal to the receipt of 35 cents of return on equity (dividends and capital gains), the relative valuation is 0.35 and investors would be left whole if their allowed return on equity was reduced by $10.50 in relation to the $30 of credits that they will receive. Again, what is required is an 'exchange rate' – the extent to which

investors would be prepared to give up dividends and capital gains in order to receive a dollar of imputation credits.

54. In the regulatory setting, theta represents this relative valuation, or exchange rate. It encapsulates all of the reasons why imputation credits have a different value to investors in aggregate relative to the allowed return on equity (dividends and capital gains).

2.3.2 Why are imputation credits less valuable than allowed equity returns (dividends and capital gains)?

55. There are a number of reasons why imputation credits are less valuable to investors than dividends or capital gains, including:

    a Some credits are distributed to non-residents who cannot redeem them and therefore do not value them at all;

    b Some credits are distributed to resident investors who are prevented from redeeming them by the 45-day rule;

    c Some credits are distributed to residents who simply fail to redeem them;

    d Investors have to wait longer to receive any benefit from the credits – whereas dividends are available to investors immediately, the investor only receives a benefit from credits when their personal tax return is finalised after the end of the tax year;

    e There is a compliance and administration cost involved in tracking and redeeming credits that is not present for dividends and capital gains;

    f Resident investors will rationally adjust their portfolios until the last dollar of credits they receive just offsets the cost they bear by concentrating their portfolio into franked dividend paying stocks and away from what would otherwise be optimal. Thus, the net benefit of the redeemed credits would, on average, be approximately half of the face amount – even for investors who are able to redeem credits.

56. For all of these reasons, and possibly others, the value to investors of imputation credits is lower than the value of the equity returns that the regulator allows the firm to provide in the form of dividends and capital gains. Theta represents the extent of this difference – the relative valuation, or ratio of the value of the credits that investors receive to the value of the allowed return on equity that they must give up under the regulatory model. That is, theta represents an exchange rate – the rate at which investors are willing to forego dividends and capital gains in order to receive imputation credits.

57. In my view, theta should be estimated in a way that captures all of the reasons why credits are less valuable than the allowed return on equity, and I show below that the market value approach does exactly that. By contrast, a redemption rate approach reflects the fact that some credits are distributed to non-residents (item (a) in the list above) but none of the other reasons why credits are less valuable to investors.

2.4 Which approach to gamma is consistent with the regulatory framework?

2.4.1 Analysis

58. In this section, I consider the question of whether consistency with the regulatory WACC framework requires:

    a A market value estimate of gamma that reflects all of the reasons why investors value credits less than the full face amount; or

    b A utilisation estimate of gamma that reflects only the extent to which non-residents are unable to redeem credits.

59. In my view, the best way to consider this question is in the context of Dr Lally's reports for the AER and QCA. In this regard, I note that Lally (2015 QCA)[9] Equation (1) shows that what is relevant is the extent to which imputation credits are capitalised into the stock price:

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

60. This equation shows that the price of a stock at the beginning of the year is equal to the present value of:

    a Dividends paid during the year;

    b Theta times the face amount of imputation credits distributed during the year; and

    c The stock price at the end of the year.

61. In this formula, R_e is the discount rate that capitalises the face amount of dividends and the future stock price into the current stock price. In the example above, R_e is the 7% required return on equity.

62. Of course, we cannot simply capitalise the face amount of imputation credits using the same discount rate because credits are clearly less valuable to aggregate investors relative to other components of return to equity holders. This is where theta comes in – it reflects the extent to which imputation credits are less valuable to investors relative to the other components of return.

63. A list of reasons why investors value credits less than other forms of return is set out in Paragraph 55 above. One of those reasons is the fact that some credits are distributed to non-residents who do not value them at all, but there are many other reasons. In summary, theta is a relative valuation term – it will reflect all of the reasons that cause credits to be less valuable relative to other forms of return.

64. Importantly, the equation from Lally (2015 QCA) above makes it clear that theta represents the extent to which imputation credits are capitalised into the (market value) stock price.

[9] Lally, M., November 2015, Review of Submissions on Gamma, Report for the QCA.

2.4.2 Consistency with dividend drop-off analysis

65. To show that dividend drop-off analysis properly estimates theta as the relative value of credits, I note that Dr Lally's formula can be rearranged slightly as follows:

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

66. Dividing all terms by the current stock price gives:

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

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

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

68. That is, in a dividend drop-off analysis, theta estimates the value of credits on a relative basis – exactly as required.

2.5 Conclusion in relation to the regulatory task

69. The regulatory framework operates in two steps:

    a In the first step, the regulator estimates the total required return on equity. In this report, I use a simple example where the regulated firm has equity of $1,000 in its regulated asset base (RAB) and investors require a return on equity of 7%, in which case investors require a total return (consisting of dividends, capital gains and imputation credits) of $70.

    b In the second step, the regulator deducts the 'value of imputation credits' and sets the allowed revenues so that the firm is able to pay the difference to investors in the form of dividends and imputation credits. For example, if the regulator estimates that the value of imputation credits to investors is $5, it will allow the firm to charge prices sufficient to provide an ex-imputation return on equity (i.e., dividends and capital gains) of $65.

70. That is, gamma plays the role of determining the amount by which the allowed dividends and capital gains will be reduced to reflect the value of the imputation credits that investors will receive. It is a form of relative valuation or an 'exchange rate' – the rate at which investors would forego dividends and capital gains in order to receive imputation credits. Thus, gamma must reflect the value of credits relative to the dividends and capital gains that those credits are replacing.

71. Dividend drop-off analysis produces an estimate of precisely this – the value of credits relative to the dividends and capital gains that those credits are replacing. I note that this is entirely consistent with the formulas set out above in Lally (2015 QCA).

72. If the QCA considers that it would be appropriate to set gamma to something other than the rate at which investors would forego dividends and capital gains in order to receive imputation credits in the real world, my view is that it would be useful to stakeholders for the QCA to explain why that is the case and how the alternative approach results in investors being properly compensated.

3 The QCA's rationale for using the redemption/ utilisation approach

3.1 Overview

73. In its UT5 Final Decision for Aurizon Network, the QCA set out two rationales for its adoption of the redemption/utilisation approach:[10]

    a The Federal Court has held that it is open to the AER to adopt the redemption/utilisation approach; and

    b The redemption/utilisation approach is consistent with rigorous derivations of the Officer (1994) model.[11]

74. In this section, I explain that:

    a The first rationale is irrelevant to the QCA's task; and

    b The second rationale has no real basis.

3.2 The Federal Court decision in relation to the National Electricity Law

75. The Court considered the operation of the particular law under which the AER operates and held that it is open to the AER to adopt the redemption/utilisation approach. By contrast, the focus of this report is on the economic role of gamma and the extent to which different approaches to gamma might result in investors being over- or under-compensated.

76. In relation to the Seqwater determination, the QCA will be more concerned about the proper economic role of gamma, and in identifying the approach that results in investors being properly compensated, than about the operation of the law under which the AER operates.

77. Logically, the QCA will decide either that:

    a Gamma represents the exchange rate that properly reflects how investors value imputation credits relative to the dividends and capital gains they replace; or that

    b Gamma represents the proportion of credits that are available for redemption by investors.

78. If the QCA decides the former, my view is that it would be inappropriate for the QCA to adopt an estimate of the 'wrong thing' on the basis that the Federal Court has held that the law allows the AER to adopt that approach.

[10] QCA, 2018, Final Decision: Aurizon Network's 2017 draft access undertaking, Appendix F, pp. 171 and following.

[11] Officer, R. R., 1994, The cost of capital of a company under an imputation system, *Accounting and Finance*, 34, 1, 1-17.

79. Alternatively, if the QCA decides the latter, the QCA should adopt a redemption estimate commensurate with its interpretation of the role of gamma – in which case the Federal Court decision is redundant.

3.3 Mathematical derivations of the Officer model

80. The mathematical derivations of the Officer (1994) model that the QCA refers to are set out in Lally and van Zijl (2003).[12] In relation to that mathematical derivation, I note that:

    a The mathematical derivation establishes that, under the assumptions of the model, the market value of imputation credits (i.e., the extent to which imputation credits are capitalised into the stock price) will be equal to a weighted-average of the utilisation rate of each investor[13] in the model (weighted by wealth and risk aversion).

    b Thus, in theory, one would obtain the same figure by using market data to estimate the market value of imputation credits or by using redemption and other data to estimate the weighted-average utilisation rate.

    c A key component of these models is that the weighted-average must be taken using the *total* wealth of each investor. In particular, if foreign investors are included in the model, the *total* wealth of those foreign investors must be used when computing the weighted-average.

    d There is no model, and no mathematical derivation, in which a weighted-average is taken using only the subset of wealth that each investor has invested into the Australian equity market. However, that is the approach that has been adopted by the QCA when it computes a weighted-average based on the wealth that residents and non-residents, respectively, have invested in Australian equities.

    e The mathematical derivation requires the weighted-average utilisation rate to also reflect the risk aversion of each investor. However, the QCA does not include risk aversion in its construction of the weighted-average.

81. In summary, the mathematical derivations establish that, under the assumptions of the model, the market value of credits is equal to the weighted-average utilisation rate (weighted by the total wealth and risk aversion of the investors in the model). In this case, the market value and the appropriate weighted-average would be identical. However, the QCA's approach is to compute a *different* weighted-average utilisation rate – one that does *not* reflect the total wealth or the risk aversion of investors.

82. In my view, it is clearly wrong to rely on the mathematical derivation of a model to support the use of a particular version of the weighted-average utilisation rate that does not appear anywhere in the mathematical derivation or in the model.

83. Moreover, the weighted-average utilisation rate will only equal the market value of credits under all of the assumptions of the model. It is entirely plausible that real life is more complex than the

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

[13] That is, the extent to which each investor is able to redeem credits. Generally, non-residents and residents who run foul of the 45-day rule are unable to redeem and have a utilisation rate of zero. Eligible resident investors have a utilisation rate of one.

setting that is developed under the simplifying assumptions of a particular model. In this case, the question facing the QCA is whether:

a Dividends and capital gains should be reduced according to the actual market value of imputation credits to investors in real life; or

b Dividends and capital gains should be reduced according to the value that credits would have under the simplifying assumptions of a particular model.

84. In my view, the deduction that the regulator makes in relation to imputation credits should be based on the actual value of imputation credits to investors because it is far more likely that:

a The particular model in question is imperfect – being limited by its restrictive assumptions; than

b Real-world investors are collectively systematically mis-valuing imputation credits.

85. But if the regulator determines that it will rely on the weighted-average utilisation rate that appears in the mathematical derivation of the model, it should rely on *that* weighted-average, and not some *other* weighted-average that does not appear in the derivation or in the model.

3.4 Conclusions in relation to the QCA rationale for its approach to gamma

86. In my view, it would be useful for the QCA to explain clearly to stakeholders:

a The basis on which it considers the Federal Court decision, in relation to the law under which the AER operates, to be relevant to its regulatory task, and the role that decision has played in its approach to setting gamma; and

b If the QCA considers that its weighted-average utilisation rate is supported by the mathematical derivation of a model, it should provide a reference to a model wherein the weighted-average uses only that portion of each investor's wealth that is invested in the Australian market and has no regard to the risk aversion of each investor. If the QCA is unable to provide such a reference, it should cease claiming that its approach is so supported.

87. In relation to the latter point, I note that Lally and van Zijl (2003) do *not* provide a derivation that is consistent with the QCA's approach. Rather, they specifically state that their model assumes away all foreign investors, noting 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,*[14]

and:

> *Since national capital markets are assumed to be segregated, it would be inconsistent to recognise foreign investors. Accordingly, we omit them from consideration.*[15]

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

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

88. But, of course, foreign investors *do* exist in Australian equity markets and their trading *does* have an effect on equilibrium prices. To assume them away to simplify the theoretical analysis would result in outcomes that do not accord with real world realities.

4 Are other WACC parameters market value estimates?

89. In this section, I conclude by noting that the QCA employs market value estimates of other WACC parameters. In particular:

    a The QCA estimates the risk-free rate using market value government bond prices. Those prices reflect the market value of the bonds to investors.

    b The QCA estimates the required return on debt using market value corporate bond prices. Those prices reflect the market value of the bonds to investors.

    c The QCA estimates the market risk premium using market value share prices. Those prices reflect the market value of the shares to investors.

    d The QCA estimates the equity beta using market value share prices. Those prices reflect the market value of the shares to investors.

    e The QCA estimates gearing using the market value of equity, computed as the number of shares outstanding multiplied by the market value share price.

90. That is, in relation to all other WACC parameters, the QCA uses traded market prices wherever they are available to obtain market value estimates. Parameters are estimated using traded bond prices that reflect the market value of bonds to investors and traded stock prices that reflect the market value of shares to investors. It is therefore odd that the QCA makes an exception in relation to gamma by estimating this parameter by having no regard at all to data on traded prices—particularly since gamma is inextricably linked, through the regulatory framework, to the return on equity. That is, as explained above, gamma represents the amount by which the allowed return on equity (estimated using market data) ought to be reduced in recognition of the fact that part of the total returns that equity investors require may be derived from the ability to redeem imputation tax credits.

91. Perhaps the closest analogy to imputation credits is the estimation of the market value of equity – where the QCA measures the number of shares outstanding and then multiplies by the market value of each share. The same applies to imputation credits where the distribution rate measures the number of credits and theta represents the market value of each.

92. In my view, internal consistency requires the QCA to estimate the market value of imputation credits.

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