AusNet Electricity Services Pty Ltd

Electricity Distribution Price Review 2016–20

Appendix 13B: Estimating Distribution and Redemption Rates from Taxation Statistics

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NERA
ECONOMIC CONSULTING

Estimating Distribution and Redemption Rates from Taxation Statistics

A report for Jemena Gas Networks, Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks and United Energy

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Project Team

Simon Wheatley

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Australia
Tel: 61 2 8864 6500 Fax: 61 2 8864 6549
www.nera.com

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Contents

List of Tables

List of Figures

Executive Summary

This report has been prepared for Jemena Gas Networks (JGN), Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks and United Energy (the networks) by NERA Economic Consulting (NERA). The networks have asked NERA to update the estimates of the rate at which imputation credits are distributed that it provided to the Energy Networks Association (ENA) in June 2013 and to respond to matters raised by the Australian Energy Regulator (AER) in its recently published *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, in other recent AER decisions and by the AER's advisors. [1] The networks have also asked NERA to compute, from tax statistics, an estimate of the rate at which imputation credits distributed are redeemed.

Gamma and the Redemption Rate

The National Electricity Rules and National Gas Rules state that: [2]

> 'γ is the value of imputation credits'

and the AER, in its *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, relies on Officer (1994) for an interpretation of what is meant by the value of imputation credits. [3] The AER, for example, states that: [4]

> 'Our approach to interpreting and estimating the value of imputation credits is guided in the first instance by the conceptual framework developed by Officer.'

While Professor Robert Officer of the University of Melbourne is a natural authority to whom to turn, extracting an interpretation from his 1994 paper is complicated by the fact that in that paper he defines gamma to be two quantities that will in general differ. In his 1994 paper, Officer defines gamma to be both:

- the proportion of credits created that are redeemed; and
- the value of a dollar of tax credits created to a representative shareholder.

We emphasise that gamma should be interpreted as the value of a dollar of tax credits created to a representative shareholder and not the proportion of credits created that are redeemed. Imputation credits created can only raise the value of a firm if credits distributed by the firm will cut its cost of equity. The extent to which the firm's cost of equity will be cut will be

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1 AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014.

2 Australian Energy Market Commission, *National Electricity Rules Version 69*, page 661.

Australian Energy Market Commission, *National Gas Rules Version 25*, page 63.

3 Officer, Robert R., *The cost of capital of a company under an imputation tax system*, Accounting and Finance, 1994, pages 1-17.

4 AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 34.

determined by the extent to which the firm distributes credits created and by the value placed on a dollar of credits distributed by a representative shareholder. [5]

In a small open economy – like Australia – the proportion of credits created that are redeemed is likely to exceed by a substantial margin the value of a dollar of tax credits created to a representative shareholder. Thus an estimate of the proportion of credits created that are redeemed is unlikely to provide an unbiased estimate of the value of a dollar of tax credits created to a representative shareholder.

In general, however, the value placed by a representative investor on a dollar of tax credits created will not exceed the proportion of credits created that are redeemed. Thus an estimate of the proportion of credits created that are redeemed can be viewed as an estimate of an upper bound on the value of a dollar of tax credits created to a representative shareholder.

The value of a dollar of tax credits created can be viewed as the product of the rate at which credits created are distributed – the distribution rate – and the value of a dollar of tax credits distributed – theta.

There will only be a single value for theta – the value that a representative investor places on a dollar of tax credits distributed. The value that the representative investor places on a dollar of tax credits distributed by one firm will not differ from the value that the investor places on a dollar of tax credits distributed by another firm. Thus theta is not a firm specific parameter.

The distribution rate, on the other hand, is a firm specific parameter. [6] One firm, after weighing up the costs and benefits of distributing credits, may decide to distribute all of the credits that have been created over some period. A second firm may rationally decide to distribute no credits – perhaps because it wishes to use internally generated funds to finance new projects.

As theta should not vary from firm to firm, however, there should be no link between how one estimates theta and how one estimates the distribution rate.

Estimates of the Distribution Rate

While the distribution rate should, in principle, be a firm specific parameter, the AER states in its *Rate of Return Guideline* that: [7]

> 'We propose that gamma be set with regard to a benchmark efficient entity informed by market wide behaviour rather than with regard to industry or firm specific values.'
>
> 'Estimating the utilisation rate on a market-wide basis is consistent with our interpretation of the nature of this parameter in the Officer framework.'

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5 We mean by the cost of equity, the cost of equity conventionally defined – that is, exclusive of a value assigned to imputation credits distributed.

6 The distribution rate is also known as the payout ratio.

7 AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'
>
> [The emphasis is ours]

The AER, in its *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, states that: [8]

> 'In considering the evidence on the distribution and utilisation rates, we have broadly maintained the approach set out in the Guideline'

and reports estimates of the distribution rate of: [9]

- 0.70, provided by NERA (2013) and computed using data from 1987-88 to 2010-11, all companies and tax statistics; [10]
- 0.80, provided by Handley (2014) and computed using data from 1987-88 to 2010-11, public companies and tax statistics; [11] and
- 0.84, provided by Lally (2014) and computed using data from 2000-01 to 2012-13 and the financial statements of the largest 20 companies listed on the Australian Stock Exchange (ASX). [12]

The most natural way of estimating a *market-wide* distribution rate is by using tax statistics aggregated across both private and public companies provided by the Australian Taxation Office (ATO). We compute an estimate of the cumulative distribution rate using data from 1987-88 to 2011-12, all companies and tax statistics to be 0.68 – little changed from the estimate that we provided around two years ago.

Again, however, the distribution rate is a firm specific parameter and so ultimately what the AER may wish to determine is what the distribution rate is for a benchmark efficient entity. The distribution rate for a benchmark efficient entity may differ from the distribution rate for the market as a whole.

The AER in its 2009 *WACC Review Final Decision* provides an analysis of what characteristics a benchmark efficient entity will display and states that: [13]

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8 AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 14.

9 AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 27.

10 NERA, *The payout ratio: A report for the Energy Networks Association*, June 2013.

11 Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

12 Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

13 AER, *Final decision Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, pages 80 and 105.

> 'The AER has reviewed the Competitive Neutrality Principles Agreement and notes that this Agreement does not explicitly state that a private sector organisation is a stock market listed business. Nor does the Agreement define the nature of private ownership.'
>
> 'the AER does not agree that a benchmark efficient NSP be defined as a large, stock market listed NSP and is a settled concept.'

This statement indicates that when determining the distribution rate for a benchmark efficient entity significant weight should be placed on estimates of the rate for companies that are not large ASX-listed companies. Companies that are not large ASX-listed companies fall into two categories:

- companies that are public companies but are not large ASX-listed companies; and
- companies that are privately owned.

To construct an estimate of the distribution rate for a public company that is not a top-20 ASX-listed company, we use the data that Lally (2014) provides and an estimate of the rate for a public company that we compute using data from 2000-01 to 2011-12 – in other words, over approximately the same period that he examines.[14] Using tax statistics, we estimate the distribution rate for a public company over this period to be 0.75. This evidence indicates, in light of the estimate of 0.80 that Handley (2014) reports for the period 1987-88 to 2010-11, that the distribution rate for public companies has fallen through time.[15] We estimate the distribution rate for public companies that are not top-20 ASX-listed companies to be 0.70 over the period 2000-01 to 2011-12. Finally, again using tax statistics, we estimate the distribution rate for private companies to be 0.50 over the period 2000-01 to 2011-12.

It follows that if significant weight is to be placed on estimates of the distribution rate for companies that are not large ASX-listed companies, an estimate of the rate for a benchmark efficient entity will not sit far from 0.70 – an estimate of the distribution rate for the market as a whole.[16] Thus it is difficult to see that there is a case for setting the distribution rate to be any different than the value accepted by the Australian Competition Tribunal in its 2010 decision and the *market-wide* value chosen in the AER's *Rate of Return Guideline* of 0.70.[17]

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[14] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[15] Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

[16] Suppose, for example, that there is a probability of 20 per cent that the benchmark efficient entity is privately owned, a probability of 60 per cent that the benchmark is a public company that is not a top-20 ASX-listed company and a probability of 20 per cent that the benchmark is a top-20 ASX-listed company. Then an estimate of the distribution rate for the benchmark using our estimates and the estimate that Lally (2014) provides would be $0.20 \times 0.50 + 0.60 \times 0.70 + 0.20 \times 0.84 = 0.69$.

Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[17] ACT, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompt9*.

AER, *Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, pages 136-180.

This value is based on a cumulative distribution rate computed using tax statistics aggregated across all companies – both private and public.

Estimates of the Redemption Rate

The rate at which credits, created or distributed, are redeemed will not provide an unbiased estimate of the value placed by a representative investor on a dollar of credit, created or distributed, but should place an upper bound on the value. This upper bound may be useful in assessing whether estimates of the value of a dollar of credits satisfy Rule 74 (2) of the National Gas Rules, relating generally to forecasts and estimates, which states that: [18]

(2) A forecast or estimate:

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

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

The government introduced a simplified imputation system on 1 July 2002 and Hathaway (2010) notes that the taxation statistics that the ATO provides for the years immediately surrounding the introduction of the system have been revised significantly a number of times.[19] For this reason, Hathaway recommends that in estimating the redemption rate from taxation statistics, one should restrict one's attention to data from 2003-04 onwards. We follow his advice. Hathaway also notes that: [20]

> 'The tax data of the ATO is the most likely to be accurate – after all what other tax data is there but tax collections by the ATO?'
>
> '(T)he FAB data is the more likely of the two sources (dividends and franking account balances) to be reliable. Companies have to record flows into and out of their FAB according to distributions and receipts. One company's credit to the FAB from franked dividend income is another company's debit. On the other hand, dividend data by the ATO can be an unreliable quantum.'

Because the tax data are the most likely to be accurate, we use ATO data on net tax and franking account balances rather than ATO dividend data to estimate the rate at which credits distributed are redeemed. We find that:

- using ATO data an estimate of the rate at which credits distributed are redeemed over the period 2003-04 to 2011-12 is 0.45.

An estimate of the distribution rate computed over the period 2003-04 to 2011-12 is 0.70 and so we also find that: [21]

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[18] Australian Energy Market Commission, *National Gas Rules Version 25*, page 54.

[19] Hathaway, N., 2010, *Imputation credit redemption: ATO data 1988-2008*, July 2010.

[20] Hathaway, N., *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone*? Capital Research, September 2013, page 23.

[21] The estimate of the redemption rate of 0.31 is computed using estimates of the distribution rate and the rate at which credits distributed are redeemed that have not been rounded to two decimal places.

- ATO data imply that the rate at which credits created are redeemed over the period 2003-04 to 2011-12 is 0.31.

This result does not suggest that gamma be set to 0.31 because the rate at which credits created are redeemed may provide a very misleading guide as to the value placed by a representative investor on a dollar of credits created. The result does suggest, however, that 0.31 can be treated as an upper bound on a value for gamma. In other words, the result does suggest that an estimate of gamma should be set no higher than 0.31.

1. Introduction

This report has been prepared for Jemena Gas Networks (JGN), Jemena Electricity Networks, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA PowerNetworks and United Energy (the networks) by NERA Economic Consulting (NERA). The networks have asked NERA to:

- examine the relation between gamma and the rate at which imputation credits are redeemed;
- update the estimates, provided to the Energy Networks Association (ENA) by NERA in June 2013, of the rate at which imputation credits are distributed ; and
- compute, from tax statistics, an estimate of the rate at which imputation credits distributed are redeemed.

The networks have also asked NERA to respond to matters raised by the Australian Energy Regulator (AER) in its recently published *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20* and in other recent AER decisions, and to address issues brought up by the AER's advisors.[22]

The remainder of this report is structured as follows:

- section 2 examines the relation between gamma and the rate at which imputation credits are redeemed;
- section 3 provides updated estimates of the distribution rate; and
- section 4 provides estimates of the redemption rate.

In addition:

- Appendix A examines the relation between the redemption rate and theta, the value of a dollar of tax credits to a representative investor;
- Appendix B provides details of how we compute estimates of the distribution and redemption rates;
- Appendix C provides the terms of reference for this report;
- Appendix D provides a copy of the Federal Court of Australia's *Guidelines for Expert Witnesses in Proceeding in the Federal Court of Australia*; and
- Appendix E provides the curriculum vitae of the author of the report.

Statement of Credentials

This report has been prepared by **Simon Wheatley**.

[22] AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014.

Simon Wheatley is an Affiliated Industry Expert with NERA, and was until 2008 a Professor of Finance at the University of Melbourne. Since 2008, Simon has applied his finance expertise in investment management and consulting outside the university sector. Simon's interests and expertise are in individual portfolio choice theory, testing asset-pricing models and determining the extent to which returns are predictable. Prior to joining the University of Melbourne, Simon taught finance at the Universities of British Columbia, Chicago, New South Wales, Rochester and Washington.

In preparing this report, the author (herein after referred to as 'I' or 'my' or 'me') confirms that I have made all the inquiries that I believe are desirable and appropriate and that no matters of significance that I regard as relevant have, to my knowledge, been withheld from this report. I acknowledge that I have read, understood and complied with the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia*. I have been provided with a copy of the Federal Court of Australia's *Practice Note CM 7, Expert Witnesses in Proceedings in the Federal Court of Australia*, dated 4 June 2013, and my report has been prepared in accordance with those guidelines.

I have undertaken consultancy assignments for Jemena in the past. However, I remain at arm's length, and as an independent consultant.

2. Gamma and the Redemption Rate

The National Electricity Rules and National Gas Rules state that: [23]

> 'γ is the value of imputation credits'

and the AER in its *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, relies on Officer (1994) for an interpretation of what is meant by the value of imputation credits. [24] The AER, for example, states that: [25]

> 'Our approach to interpreting and estimating the value of imputation credits is guided in the first instance by the conceptual framework developed by Officer.'

While Professor Robert Officer of the University of Melbourne is a natural authority to whom to turn, extracting an interpretation from his 1994 paper of what is meant by gamma is complicated by the fact that in that paper he defines gamma to be two quantities that will in general differ. In his 1994 paper, Officer defines gamma to be both:

- the proportion of credits created that are redeemed; and
- the value of a dollar of tax credits created to a representative shareholder.

We emphasise below that gamma should be interpreted as the value of a dollar of tax credits created to a representative shareholder and not the proportion of credits created that are redeemed. Imputation credits created can only raise the value of a firm if credits distributed by the firm will cut its cost of equity. The extent to which the firm's cost of equity will be cut will be determined by the extent to which the firm distributes credits created and by the value placed by a representative shareholder on a dollar of credits received. [26] In a small open economy – like Australia – the proportion of credits created that are redeemed is likely to exceed by a substantial margin the value, to a representative shareholder, of a dollar of tax credits created. Thus an estimate of the proportion of credits created that are redeemed is unlikely to provide an unbiased estimate of the value of a dollar of tax credits created to a representative shareholder.

In general, however, the value placed by a representative investor on a dollar of tax credits created will not exceed the proportion of credits created that are redeemed. Thus an estimate of the proportion of credits created that are redeemed can be viewed as an estimate of an upper bound on the value, to a representative shareholder, of a dollar of tax credits created.

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[23] Australian Energy Market Commission, *National Electricity Rules Version 69*, page 661.

Australian Energy Market Commission, *National Gas Rules Version 25*, page 63.

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

[25] AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 34.

[26] We mean by the cost of equity, the cost of equity conventionally defined – that is, exclusive of a value assigned to imputation credits distributed.

Officer (1994) assumes, for simplicity, that all credits created are distributed. In practice, this is not the case and so gamma, the value to a representative investor of a dollar of tax credits created, is computed as the product of the distribution rate – the fraction of credits created that are distributed – and the value of a dollar of tax credits distributed to a representative investor – typically labelled theta.

There will only be a single value for theta. The value that a representative investor places on a dollar of tax credits distributed by one firm will not differ from the value that the investor places on a dollar of tax credits distributed by another firm. Thus theta is not a firm specific parameter.

The distribution rate, on the other hand, is a firm specific parameter. One firm, after weighing up the costs and benefits of distributing credits, may decide to distribute all of the credits that have been created over some period. A second firm may rationally decide to distribute no credits – perhaps because it wishes to use internally generated funds to finance new projects. [27]

As theta should not vary from firm to firm, however, there should be no link between how one estimates theta and how one estimates the distribution rate. Estimates of theta constructed using data on publicly listed companies, for example, need not be matched up with estimates of the distribution rate constructed using data on publicly listed companies.

2.1. Officer's Framework

Officer (1994) addresses two questions: [28]

- What is the appropriate definition of a company's cost of capital?
- How should a firm's cost of capital be measured?

In addressing these questions, Officer introduces a parameter called 'gamma'. Unfortunately, Officer defines gamma to be two quantities that will in general differ. He states that: [29]

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[27] While the distribution rate should, in principle, be a firm specific parameter, the AER states in its *Rate of Return Guideline* that:

> 'We propose that gamma be set with regard to a benchmark efficient entity informed by market wide behaviour rather than with regard to industry or firm specific values.'
>
> 'Estimating the utilisation rate on a market-wide basis is consistent with our interpretation of the nature of this parameter in the Officer framework.'
>
> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'

[The emphasis is ours]

AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

[28] Officer, Robert R., *The cost of capital of a company under an imputation tax system*, Accounting and Finance, 1994, page 2.

[29] Officer, Robert R., *The cost of capital of a company under an imputation tax system*, Accounting and Finance, 1994, page 4.

> 'A proportion (γ) of the tax collected from the company will be rebated against personal tax and, therefore, is not really company tax but rather is a collection of personal tax at the company level.'
>
> 'γ can be interpreted as the value of a dollar of tax credits to the shareholder.'

To understand which of these two alternative definitions is correct, it will be necessary to take a close look at Officer's analysis.

2.1.1. Officer's analysis of the appropriate definition of the cost of capital

Investors, besides the imputation credits that they may be able to redeem, face a wide array of taxes at the personal level on the dividends and interest that they receive. So an important question is: How should these credits and taxes affect the *WACC* formula that one should use for discounting cash flows conventionally defined? The answer is that, in a simple perpetuity framework, taxes levied at the personal level on income from equity and debt and credits distributed to equity holders will not affect the *WACC* formula that one should use. Personal taxes and credits distributed can affect the return that the market requires on equity and the return that the market requires on debt, but they do not, in a perpetuity framework, affect the *WACC* formula that one should use. If personal taxes on dividends are high, the market may require that the return to equity that pays dividends be high. If personal taxes on interest are high, the market may require that the return to holding debt be high. If imputation credits can be used to reduce personal taxes, the market may accept a lower return, exclusive of a value assigned to credits, to equity that delivers credits. So taxes at the personal level and credits distributed can surely affect a company's *WACC* conventionally defined. Taxes at the personal level and credits distributed, though, will not affect the *WACC* formula that one should use for discounting cash flows conventionally defined.

As Berk and DeMarzo make clear in their corporate finance text:[30]

> 'the equity and debt cost of capital in the market *already* reflects the effects of investor taxes. As a result, *the WACC method does not change in the presence of investor taxes*.'
> [The emphasis is theirs]

Suppose that a firm is expected to deliver an operating income before taxes of X_O in perpetuity, it has perpetual risk-free debt with market value D outstanding that will pay interest at the rate of r_D per period, the market value of its equity is E, the cost of equity, exclusive of personal taxes or credits received, is $\mathrm{E}(r_E)$ per period, the corporate tax rate is T and the firm will follow a policy of distributing all cash flows each period.

If the firm follows a policy of maintaining a constant leverage through time, the value of the firm will be given by:

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[30] Berk, Jonathan and Peter DeMarzo, 2007, *Corporate finance*, Pearson Addison-Wesley, Boston, MA, USA, page 606.

$$V = \frac{X_O - T(X_O - r_D D)}{WACC}, \quad (1)$$

where:

$$WACC = \frac{D}{V} r_D + \frac{E}{V} \mathrm{E}(r_E) \quad (2)$$

In words, the value of the firm will be the after-corporate-tax net cash flows that the market expects the firm to deliver in perpetuity, discounted at the firm's *WACC* conventionally defined. This analysis indicates that if personal taxes and credits will affect a firm's value, they will do so through their impact on the returns required on equity and debt.

Officer (1994) provides an alternative way of valuing a firm when there are credits issued that lower personal taxes.[31] He provides a definition for the cost of equity for a firm that includes a portion of the imputation credits that the firm issues. In particular, he defines the cost of equity after company tax but before personal tax to be:

$$\mathrm{E}(\hat{r}_E) = \left(\frac{1-(1-\gamma)T}{1-T} \right) \mathrm{E}(r_E) \quad (3)$$

$\mathrm{E}(r_E)$ represents the required return on equity excluding imputation credits and $\mathrm{E}(\hat{r}_E)$ represents the required return on equity including a fraction γ of the imputation credits that are distributed each period.[32] Similarly, Officer defines the *WACC* after company tax but before personal tax (i.e., including the value of imputation credits) to be:

$$\hat{WACC} = \frac{D}{V} r_D + \frac{E}{V} \mathrm{E}(\hat{r}_E) \quad (4)$$

Officer (1994) shows that one can use this after-company-tax but before-personal-tax *WACC* to compute the value of the firm. One can do so if instead of discounting the after-corporate-tax net cash flows of $X_O - T(X_O - r_D D)$ at the *WACC* defined by (2), one discounts the after-corporate-tax but before-personal-tax net cash flows of $X_O - (1-\gamma)T(X_O - r_D D)$ at the *WACC* defined by (4). In other words, one can compute the value of the firm as:

$$V = \frac{X_O - (1-\gamma)T(X_O - r_D D)}{\hat{WACC}} \quad (5)$$

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

[32] Note that Officer assumes that a firm is expected to deliver an operating income before taxes of X_O in perpetuity. If instead the operating income before taxes that a firm is expected to deliver will grow through time, then the expression (3) will no longer represent the required return on equity including imputation credits.

Conditional on a choice for the cost of equity exclusive of credits, $E(r_E)$, the value of the firm that one derives by using the formula (5) will be *independent* of the value of gamma. This implies that Officer's framework is consistent with the conventional framework that Berk and DeMarzo (2007) describe because one can always set gamma to be zero.[33] The insertion of gamma into numerator of (5) is *necessitated* by defining the cost of equity in such a way that it too depends on gamma.

To summarise, an analysis of Officer's cost-of-capital framework indicates that the sole channel through which the distribution of imputation credits can affect firm value is through the impact of the distribution of credits on the cost of equity. The impact of the distribution of credits on a firm's cost of equity will be determined by the rate at which the firm distributes credits and the value placed by a representative shareholder on a dollar of credits received. Officer (1994) provides a single-period model that one can use in determining the return required on equity and it is to an examination of this model that we now turn.[34]

2.1.2. Officer's model for measuring the cost of capital

Officer does not provide a formal derivation of the model that he puts forward, but deriving a simple version of his model will be useful in understanding how a difference can arise between:

- the proportion of credits created that are redeemed; and
- the value of a dollar of tax credits created to a representative shareholder.

We will assume, for simplicity, that:

- there are two types of investors – D investors who are domestic and who can redeem imputation credits and F investors who are foreign and who cannot redeem credits – and both investors share the same beliefs;
- there are two risky assets – one domestic that distributes credits and one foreign that does not;
- there is a risk-free rate at which both investors can borrow or lend freely;
- there is a single currency, no inflation and no transaction costs; and
- each investor has start-of-period wealth of one dollar and seeks to minimise:[35]

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[33] Berk, Jonathan and Peter DeMarzo, 2007, *Corporate finance*, Pearson Addison-Wesley, Boston, MA, USA, page 606.

[34] Officer, Robert R., *The cost of capital of a company under an imputation tax system*, Accounting and Finance, 1994, pages 8-10.

[35] Ingersoll (1987) shows that if the returns to the two risky assets are bivariate normal, then an investor who displays constant absolute risk aversion of φ will seek to minimise the quantity (6).

Ingersoll, J., 1987, *Theory of financial decision making*, Rowman and Littlefield, page 98.

$$\frac{\varphi}{2}\sigma^2(W_{1j}) - \mathrm{E}(W_{1j}) \tag{6}$$

where:

φ	=	a measure of the risk aversion of each investor – we assume that each investor is equally risk averse;
$\sigma^2(W_{1j})$	=	the variance of W_{1j}; and
W_{1j}	=	the end-of-period wealth of investor j.

The end-of-period wealth of investor j is given by:

$$W_{1j} = 1 + x_{1j}(r_1 + \theta_j c_1) + x_{2j} r_2 + (1 - x_{1j} - x_{2j}) r_f \tag{7}$$

where:

x_{ij}	=	the weight placed by investor j in the risky asset i;
r_i	=	the return to risky asset i;
θ_j	=	the value placed by investor j on a one-dollar tax credit;
c_1	=	the credit yield attached to asset 1 – assumed to be known at the start of the period; and
r_f	=	the risk-free rate.

Asset 1 is the domestic risky asset while asset 2 is the foreign risky asset. We assume that imputation credits can be redeemed immediately and so for domestic investors $\theta_j = 1$ while for foreign investors $\theta_j = 0$.

Appendix A shows that with these assumptions the returns required on the two risky assets will satisfy Officer's pricing model: [36]

$$\mathrm{E}(r_i) + \theta c_i - r_f = \beta_i \left(\mathrm{E}(r_m) + \theta c_m - r_f \right), \qquad i = 1, 2, \tag{8}$$

where c_i and c_m are the credit yields of risky asset i and the world market portfolio, β_i is the beta of risky asset i, $\mathrm{E}(r_m)$ is the expected return to the world market portfolio and

$$\theta = \frac{D}{D + F} \tag{9}$$

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[36] McKenzie, M. and G. Partington, *Report to the AER: Response to questions related to the estimation and theory of theta*, 7 March 2011, page 15.

measures the impact of imputation credits distributed on the return required on domestic equity. The parameter θ is the value placed on a dollar of tax credits by a representative investor. If there are few domestic investors relative to foreign investors, then the representative investor will most closely resemble a foreign investor and the impact of imputation credits distributed on the return required on domestic equity will be negligible.

Officer's pricing model says that if a representative investor places a value on credits distributed, then the return required on a share of equity that distributes credits will, all else constant, be lower than if the investor were to place no value on credits distributed. Again, however, if the domestic country is a small open economy, the impact on the return required on equity will be negligible. The impact will be negligible because only a small decline in the return required on domestic equity will be necessary to persuade foreign investors – of which there are, by assumption, many – to dramatically lower their aggregate holdings of domestic equity.

Appendix A also shows that with the assumptions made, the rate at which credits are redeemed will not fall below θ. In other words, the redemption rate will be an upper bound for the value placed by a representative investor on a dollar of tax credits distributed. The gap between the redemption rate and θ may, however, be large. That is, the redemption rate may sit far above the value placed by a representative investor on a dollar of tax credits distributed.

In contrast, McKenzie and Partington (2011) state that: [37]

> 'Taxation statistics do not give an upper bound on either the market value of franking credits, or the utilisation rate of the marginal investor. Since the utilisation rate of the marginal investor might lie above the average utilisation ratio, it is therefore possible for the market value of franking credits, determined by the marginal investor, to lie above the average utilisation ratio that the taxation statistics provide.'

In other words, McKenzie and Partington assert that the rate at which credits distributed are redeemed need not be an upper bound on the value placed by a representative investor on a dollar of tax credits distributed. The idea that the redemption rate need not be an upper bound on the value placed by a representative investor on a dollar of tax credits distributed is counterintuitive. One would expect investors who value credits highly to hold stocks that distribute credits and to redeem credits at a higher rate than the representative investor. We have tried to think of a numerical example – pathological or otherwise – in which the assertion that McKenzie and Partington make is true and have been unable to do so. Thus our advice, based on an analysis of the model that Officer provides, is that the rate at which

[37] McKenzie, M. and G. Partington, *Report to the AER: Response to questions related to the estimation and theory of theta*, SIRCA, 2011, page 15.

distributed credits are redeemed should be viewed as an upper bound on the value placed by a representative investor on a dollar of tax credits distributed. [38]

2.2. The Distribution Rate and Theta

In Officer's analysis, all credits created are distributed. In practice, this is not the case and so gamma, the value to a representative investor of a dollar of tax credits created, is computed as the product of the distribution rate – the fraction of credits created that are distributed – and the value of a dollar of tax credits distributed to a representative investor – typically labelled theta.

There will only be a single value for theta, the value that a representative investor places on a dollar of tax credits distributed. The value that the representative investor places on a dollar of tax credits distributed by one firm will not differ from the value that the investor places on a dollar of tax credits distributed by another firm. Thus theta is not a firm specific parameter.

The distribution rate, on the other hand, is a firm specific parameter. One firm, after weighing up the costs and benefits of distributing credits, may decide to distribute all of the credits that have been created over some period. A second firm may rationally decide to distribute no credits – perhaps because it wishes to use internally generated funds to finance new projects. [39]

As theta should not vary from firm to firm, there should be no link between how one estimates theta and how one estimates the distribution rate. The most straightforward way to estimate theta is to use the returns to public companies and information on the credits that these companies distribute. This is because reliable data are available for public companies. The use of public companies to estimate theta, however, should not dictate that the distribution rate be estimated using solely public companies. The task in estimating the distribution rate is to estimate the distribution rate that a benchmark efficient entity would adopt, and so the work necessitates that one identify the benchmark efficient entity – which may or may not be a public company. The AER has been clear in the past, as we will note in section 3, that the benchmark efficient entity need not be a public company.

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[38] In a world with many domestic risky assets, the redemption rate for a *single* domestic asset may fall below theta if the asset's credit yield is sufficiently low. This is because domestic investors will shun not only foreign assets that distribute no credits but also domestic assets that distribute no or few credits.

[39] Again, while the distribution rate should, in principle, be a firm specific parameter, the AER states in its *Rate of Return Guideline* that:

> 'We propose that gamma be set with regard to a benchmark efficient entity informed by market wide behaviour rather than with regard to industry or firm specific values.'
>
> 'Estimating the utilisation rate on a market-wide basis is consistent with our interpretation of the nature of this parameter in the Officer framework.'
>
> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'

[The emphasis is ours]

AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

In contrast to this analysis, the AER, in its *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, states that: [40]

> 'In the Guideline, we did not recognise the relationship between definitions and estimates of the distribution rate and the utilisation rate. A given estimate of the distribution rate represents the proportion of credits distributed by a given set of companies to the set of investors in those companies. For consistency in estimating the value of imputation credits, it follows that a corresponding estimate of the utilisation rate should reflect the utilisation of that same set of investors.
>
> We consider that this relationship should be recognised when determining estimates of the value of imputation credits. We therefore consider that estimates of the utilisation rate determined with regard to investors in listed equity only should be paired with estimates of the distribution rate that are also determined with regard to listed equity only. Similarly, estimates of the utilisation rate determined with regard to all equity should be paired with estimates of the distribution rate that are also determined with all equity.'

There is no requirement that estimates of theta constructed using data on public companies be matched with estimates of the distribution rate constructed using data on public companies. Indeed, the AER states in its 2009 *WACC Review Final Decision* that: [41]

> 'the AER does not agree that a benchmark efficient NSP be defined as a large, stock market listed NSP and is a settled concept'

and so concludes in its 2013 *Rate of Return Guideline* that: [42]

> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'
>
> [The emphasis is ours]

To estimate the distribution rate on a *market-wide* basis will require the use of data on both public and private companies.

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[40] AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 34.

[41] AER, *Final decision Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, page 105.

[42] AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

3. Estimates of the Distribution Rate

The AER, in its *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015-20*, reports estimates of the distribution rate of: [43]

- 0.70, provided by NERA (2013) and computed using data from 1987-88 to 2010-11, all companies and tax statistics;[44]
- 0.80, provided by Handley (2014) and computed using data from 1987-88 to 2010-11, public companies and tax statistics;[45] and
- 0.84, provided by Lally (2014) and computed using data from 2000-01 to 2012-13 and the financial statements of the largest 20 companies listed on the Australian Stock Exchange (ASX). [46]

In this section we construct estimates of the distribution rate using currently available data for all companies from the taxation statistics that the Australian Taxation Office (ATO) provides. Using data for all companies from 1987-88 to 2011-12, we estimate the cumulative distribution rate as of the end of the 2011-12 financial year to be 0.68 and the average annual distribution rate since 2000-01 to be 0.67. The distribution rate, however, is a firm specific parameter and so ultimately what the AER must determine is what the distribution rate is for a benchmark efficient entity. The distribution rate for a benchmark efficient entity may differ from the distribution rate for the market as a whole. [47]

The AER in its 2009 *WACC Review Final Decision* provides an analysis of what characteristics a benchmark efficient entity will display and states that: [48]

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[43] AER, *Draft decision Jemena Gas Networks (NSW) Ltd Access arrangement 2015–20 Attachment 4 - Value of imputation credits*, November 2014, page 27.

[44] NERA, *The payout ratio: A report for the Energy Networks Association*, June 2013.

[45] Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

[46] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[47] Once more, we note that while the distribution rate should, in principle, be a firm specific parameter, the AER states in its *Rate of Return Guideline* that:

> 'We propose that gamma be set with regard to a benchmark efficient entity informed by market wide behaviour rather than with regard to industry or firm specific values.'
>
> 'Estimating the utilisation rate on a market-wide basis is consistent with our interpretation of the nature of this parameter in the Officer framework.'
>
> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'

[The emphasis is ours]

AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

[48] AER, *Final decision Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, pages 80 and 105.

> 'The AER has reviewed the Competitive Neutrality Principles Agreement and notes that this Agreement does not explicitly state that a private sector organisation is a stock market listed business. Nor does the Agreement define the nature of private ownership.'
>
> 'the AER does not agree that a benchmark efficient NSP be defined as a large, stock market listed NSP and is a settled concept.'

These statements indicate that in determining the distribution rate for a benchmark efficient entity significant weight should be placed on estimates of the rate for companies that are not large ASX-listed companies. Companies that are not large ASX-listed companies fall into two categories:

- companies that are public companies but are not large ASX-listed companies; and
- companies that are privately owned.

To construct an estimate of the distribution rate for a public company that is not a top-20 ASX-listed company, we use the data that Lally (2014) provides and an estimate of the rate for a public company that we compute using data from 2000-01 to 2011-12 – in other words, over approximately the same period that he examines.[49] Using tax statistics, we estimate the distribution rate for a public company over this period to be 0.75. This evidence indicates, in light of the estimate of 0.80 that Handley (2014) reports for the period 1987-88 to 2010-11, that the distribution rate for public companies has fallen through time.[50] We estimate the distribution rate for public companies that are not top-20 ASX-listed companies to be 0.70 over the period 2000-01 to 2011-12. Finally, we estimate the distribution rate for private companies to be 0.50 over the period 2000-01 to 2011-12.

Thus, if significant weight is to be placed on estimates of the distribution rate for companies that are not large ASX-listed companies, an estimate of the rate for a benchmark efficient entity will not sit far from 0.70 – an estimate of the distribution rate for the market as a whole. Thus it is difficult to see that there is a case for setting the distribution rate to be any different from the value accepted by the Australian Competition Tribunal in its 2010 decision and chosen in the AER's *Rate of Return Guideline* of 0.70.[51] This value is based on a cumulative distribution rate computed using tax statistics aggregated across all companies – both private and public.

3.1. Cumulative and Annual Distribution Rates

The most recent edition of the ATO's published taxation statistics is *Taxation Statistics 2011-12*. Within this publication, information that one can use to estimate the *market-wide*

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[49] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[50] Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

[51] ACT, *Application by Energex Limited (Distribution Ratio (Gamma)) (No 3) [2010] ACompt9*.

AER, *Explanatory Statement Rate of Return Guideline (Appendices)*, December 2013, pages 136-180.

distribution rate can be found in *Company Tax: Table 1: Selected items, for income years 1979-80 to 2011-12*.[52] We also use information contained in *Company Tax: Table 1: Selected items, for income years 1979-80 to 2010-11* (the '2010-11 company tax workbook').[53]

Changes have been introduced to the calculation statement of the company tax return and to the definition of net taxes that have led to a little more work in calculating a measure of the taxes that companies have paid in each year. A full description of how we compute net tax, appropriately adjusted, for each year is contained in Appendix B. Here in the text of the report we provide a description only in broad terms of how we go about computing estimates of the distribution rate.

3.1.1. Cumulative distribution rate

The cumulative distribution rate estimates the total proportion of all imputation credits created that have been distributed by companies since the start of the tax imputation system on 1 July 1987.

The cumulative distribution rate is relatively straightforward to calculate, since:

- the total amount of imputation credits not distributed (that is, retained) is reported for each year in the franking account balances; and
- the total amount of imputation credits created can be derived from the net tax paid, appropriately adjusted, since 1 July 1987.

We therefore compute the cumulative distribution rate as:[54]

$$CUMULATIVE\ DISTRIBUTION\ RATE(t) = 1 - \frac{FAB(t)}{\sum_{s=1}^{t} NET\ TAX(s)} \qquad (10)$$

where year 1 is the year in which the imputation system began.

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[52] Company Tax: Table 1 for 2011-12 can be found in the workbook taxstats2012company1selecteditemsbyyear.xls which in turn can be found at:

https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=coy_detailed#coy_detailed

[53] Company Tax: Table 1 for 2010-11 can be found in the workbook cor00345977_2011COM1.xls which in turn can be found at:

https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

[54] $CUMULATIVE\ DISTRIBUTION\ RATE(t)$ denotes the cumulative distribution rate from 1 July 1987 until the end of period t, $FAB(t)$ denotes the franking account balance at the end of t and $NET\ TAX(s)$ denotes the net tax paid in period s.

There is the potential that this method will overestimate the cumulative distribution rate (that is, that it could overstate the true cumulative distribution rate). The first source of potential for bias arises because the published franking account balance at the end of each financial year is the sum of the franking accounts of reporting companies. If a company goes bankrupt, any credits in its franking account will cease to be reported to the ATO. Since a bankrupt company's retained imputation credits will no longer be reported, our measure of the cumulative distribution rate will assume the credits have been distributed. In reality, the credits retained by bankrupt companies are, typically, never distributed. Thus, for this reason, our measure of the distribution rate may be upwardly biased. This analysis suggests that the cumulative distribution rate constructed from tax statistics is likely to represent an upper bound on the market-wide rate at which imputation credits are distributed.

The second potential source of bias arises because some firms fail to report their franking account balances. Our measure of the cumulative distribution rate will treat any unreported franking balances as being distributed even though no credits may have actually been distributed. So this is also a reason why our measure of the distribution rate may be upwardly biased.

While it is not possible to determine the extent of these upward biases attached to estimates of the cumulative distribution rate, we note that in correspondence with the ATO, the ATO informed us that the substantial rise in the Class C franking account balance from 1999-00 to 2000-01 was due, in part, to an increase of around 11,000 entities completing the label.[55]

3.1.2. Annual distribution rate

The annual distribution rate measures the ratio of imputation credits distributed to those created in a given year. We calculate the annual distribution rate as:

$$ANNUAL\,DISTRIBUTION\,RATE(t) = \frac{NET\,TAX\,(t) - FAB(t) + FAB(t-1)}{NET\,TAX\,(t)} \qquad (11)$$

Note that this measure of the annual distribution rate, like our measure of the cumulative distribution rate can be distorted. It can provide a distorted measure of the true annual distribution rate because:

- companies that enter bankruptcy will no longer report their existing franking account balances – this can lead one to overestimate the annual distribution rate; and
- some firms will fail to report their franking account balances – this can lead one to overestimate the annual distribution rate when the level of underreporting rises and underestimate the annual distribution rate when the level of underreporting falls.

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[55] A label is the ATO's description of what the US Internal Revenue Service would refer to as a line. It is a request by the ATO for information. Thus an entity that completes a label enters data in the space provided by the ATO on the appropriate line. See, for example:

ATO, *Company tax return instructions*, 2012.

We note that changes to the reporting requirements in the 2002-03 financial year were associated with a large reduction in an estimate of the credits distributed by firms. The lower annual distribution rate for this year is potentially a reflection of the new reporting requirements raising the rate at which companies report their franking account balances.

In our 2013 report for the ENA, we also computed a second lower estimate of the annual distribution rate using as a measure of credits distributed: the credits that companies report that they distribute less the credits that companies report that they receive directly from other companies, less an estimate of the credits that life offices distribute. [56, 57] We do not report an estimate computed in this way here because, like Hathaway (2013), we suspect that an estimate of the distribution rate that relies on franking account balances and a measure of taxes paid will be more accurate than an estimate that relies on dividend data. [58] As Hathaway notes: [59]

> 'The tax data of the ATO is the most likely to be accurate – after all what other tax data is there but tax collections by the ATO?'
>
> '(T)he FAB data is the more likely of the two sources (dividends and franking account balances) to be reliable. Companies have to record flows into and out of their FAB according to distributions and receipts. One company's credit to the FAB from franked dividend income is another company's debit. On the other hand, dividend data by the ATO can be an unreliable quantum.'

3.2. Estimates of the Cumulative and Annual Distribution Rates

3.2.1. Estimates of the cumulative distribution rate

Table 3.1 provides the cumulative net corporate tax paid, the franking account balance (adjusted for changes in the way the ATO reports franking account balances between 2001-02 and 2002-03) and an estimate of the cumulative distribution rate for each year from 1995-96 to 2011-12. [60] The table indicates that the franking account balance has risen monotonically each year from 1995-96 to 2011-12.

Figure 3.1 illustrates the steady rise in the franking account balance. In the four years for which data have become available since the AER made submissions to the Australian

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[56] Life offices provide life insurance and superannuation to individuals and through their superannuation businesses redeem imputation credits. The Australian Prudential Regulation Authority (APRA) reports that the operating profit after tax of the life offices that it regulates for the year 2013 was $2.7 billion, with $1.5 billion attributable to superannuation business.

http://www.apra.gov.au/mediareleases/pages/14_13.aspx

[57] NERA, *The payout ratio: A report for the Energy Networks Association*, June 2013.

[58] Hathaway, N., *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone*? Capital Research, September 2013.

[59] Hathaway, N., *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone*? Capital Research, September 2013, page 23.

[60] Before 1 July 2002, the ATO reports franking account balances as the amount of franked dividends that the companies could distribute. From 1 July 2002 (i.e., from 2002-03) the ATO's franking account balances represent the amount of franking credits that could be attached to dividends.

Competition Tribunal in December 2010, the franking account balance has grown by $66.2 billion from $179.5 billion to $245.7 billion. In other words, the franking account balance has grown by 37 per cent over these four years.

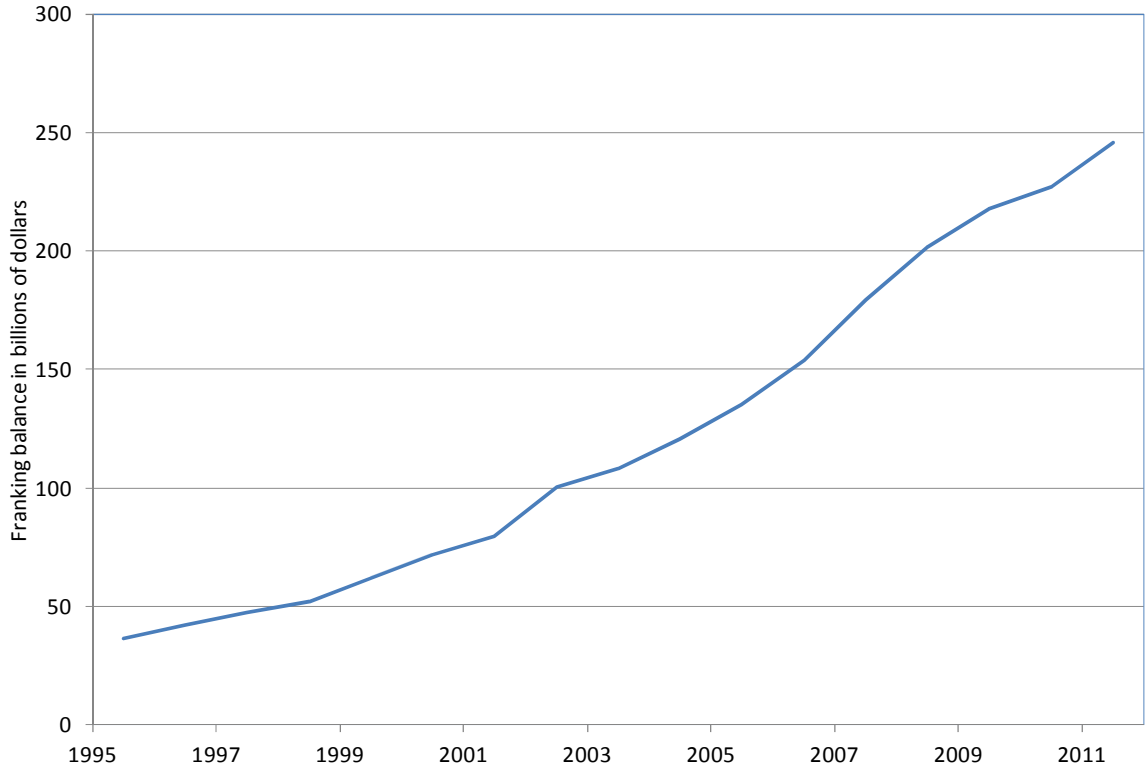
Table 3.1 also shows that there has been little variation in the cumulative distribution rate. The cumulative distribution rate has ranged over the 17 years from 1995-96 to 2011-12 from a low of 0.66 in 2002-03 to a high of 0.72 in 1998-99. The cumulative distribution rate currently sits at 0.68.

Table 3.1
Cumulative distribution rate

Year	Cumulative net tax	Franking account balance	Cumulative distribution rate
1995-96	118,840	36,310	0.69
1996-97	137,851	42,044	0.70
1997-98	159,646	47,325	0.70
1998-99	182,610	51,919	0.72
1999-00	211,270	61,856	0.71
2000-01	238,904	72,039	0.70
2001-02	267,117	79,712	0.70
2002-03	298,380	100,119	0.66
2003-04	334,933	108,109	0.68
2004-05	376,419	120,786	0.68
2005-06	425,648	135,127	0.68
2006-07	484,759	153,922	0.68
2007-08	543,434	179,510	0.67
2008-09	602,211	201,381	0.67
2009-10	655,137	217,691	0.67
2010-11	717,486	226,970	0.68
2011-12	778,157	245,702	0.68

Notes: Cumulative net tax since the start of the imputation system on 1 July 1987 and franking account balances are in millions of dollars. The cumulative distribution rate is calculated as one minus the ratio of the franking account balance to cumulative net tax. Data for Class A franking account balances are from the ATO's Taxation Statistics 2010-11, Company Tax: Table 1 while all other data are from the ATO's Taxation Statistics 2011-12, Company Tax: Table 1. Data for Class C franking account balances that the ATO provides start in 1995-96.

Figure 3.1
Franking account balance



Notes: The cumulative distribution rate is calculated as one minus the ratio of the franking account balance to cumulative net tax. Data for Class A franking account balances are from the ATO's Taxation Statistics 2010-11, Company Tax: Table 1 while all other data are from the ATO's Taxation Statistics 2011-12, Company Tax: Table 1.

3.2.2. Estimates of the annual distribution rate

While there has been little variation in the cumulative distribution rate over the 17 years that we examine, there has been a substantial variation over time in estimates of the annual distribution rate. Table 3.2 provides, for each year, net tax, appropriately adjusted, credits distributed and the annual distribution rate. The annual distribution rate ranges from a low of 0.35 in 2002-03 to a high of 0.85 in 2010-11. The annual distribution rate currently sits at 0.69 – little different from the current cumulative distribution rate.

In our 2013 report for the ENA, we noted that an estimate of the annual distribution rate for the year 2010-11 based on data drawn from the 2010-11 company tax workbook was 0.92 and that this high 2010-11 annual distribution rate suggested that perhaps firms may have decided to lift the fraction of credits created that they distribute.[61] We warned, however, that the estimate should be treated with caution because an analysis of how the ATO revises the data that it provides had indicated that initial estimates of the annual distribution rate

[61] NERA, *The payout ratio: A report for the Energy Networks Association*, June 2013, pages 8-11.

constructed from the data are subsequently revised downwards by 0.07 on average. A glance at Table 3.2 will show that this is precisely what has happened. The annual distribution rate for 2010-11 has been revised downwards from 0.92 to 0.85. In addition, the annual distribution rate has subsequently fallen to 0.69 – around its long-run average – for the year 2011-12. We have not attempted to update our analysis of the revisions that the ATO makes to its data because of the complications introduced by the changes made to the calculation statement of the company tax return.

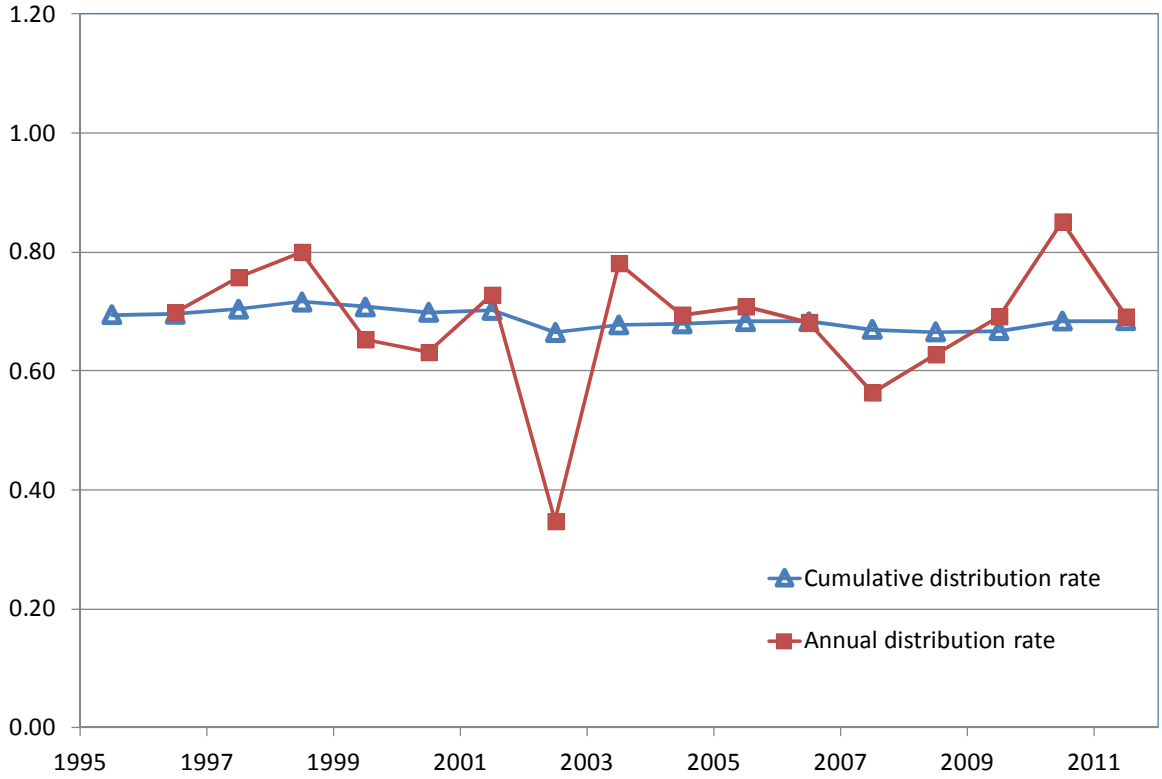
Table 3.2
Annual distribution rate

Year	Net tax	Credits distributed	Annual distribution rate
1995-96	16,856		
1996-97	19,011	13,278	0.70
1997-98	21,795	16,514	0.76
1998-99	22,963	18,369	0.80
1999-00	28,660	18,722	0.65
2000-01	27,634	17,452	0.63
2001-02	28,213	20,540	0.73
2002-03	31,263	10,856	0.35
2003-04	36,553	28,563	0.78
2004-05	41,486	28,809	0.69
2005-06	49,229	34,888	0.71
2006-07	59,111	40,316	0.68
2007-08	58,676	33,088	0.56
2008-09	58,777	36,906	0.63
2009-10	52,926	36,615	0.69
2010-11	62,349	53,071	0.85
2011-12	60,671	41,938	0.69

Notes: Net tax and credits distributed are in millions of dollars. Data for Class A franking account balances are from the ATO's Taxation Statistics 2010-11, Company Tax: Table 1, while all other data are from the ATO's Taxation Statistics 2011-12, Company Tax: Table 1.

Figure 3.2 plots the cumulative distribution rate and the annual distribution rate against time.

Figure 3.2
Estimates of the distribution rate computed from tax statistics



Note: Data for Class A franking account balances are from the ATO's Taxation Statistics 2010-11, Company Tax: Table 1 while all other data are from the ATO's Taxation Statistics 2011-12, Company Tax: Table 1.

3.3. The Distribution Rate of a Benchmark Efficient Entity

The distribution rate is a firm specific parameter and so ultimately what the AER must determine is what the distribution rate is for a benchmark efficient entity. The distribution rate for a benchmark efficient entity may differ from the distribution rate for the market as a whole and whether it does or not is an empirical question. It is to this empirical question that we now turn.

The AER provides little discussion in its *Rate of Return Guideline* about the characteristics that, it believes, a benchmark efficient entity should display. In particular, the AER does not indicate whether it believes that a benchmark efficient entity should be a publicly listed company or whether it believes that a benchmark efficient entity should be large or small.[62] A search of the regulator's *Explanatory Statement*, for example, reveals that the document does not use the phrase 'publicly listed'. The AER does, however, examine the issue of what

[62] AER, *Better Regulation Explanatory Statement Rate of Return Guideline*, December 2013.

characteristics a benchmark efficient entity should display in some detail in its 2009 *WACC Review*. In this review, the AER states that: [63]

> 'The AER has reviewed the Competitive Neutrality Principles Agreement and notes that this Agreement does not explicitly state that a private sector organisation is a stock market listed business. Nor does the Agreement define the nature of private ownership.'
>
> 'the AER does not agree that a benchmark efficient NSP be defined as a large, stock market listed NSP and is a settled concept.'

There is no evidence that the AER changed its position in the *Rate of Return Guideline* published in December 2013. Also, we note that the market capitalisation ranks that SIRCA provides in its Share Price and Price Relative (SPPR) database indicate that none of the nine comparator firms that the AER instructs Henry (2014) to use were top-20 ASX-listed firms over the period that he examines. [64, 65] Table 3.3 below lists the ranks for the end-of-sample month for each firm.

Table 3.3
Market capitalisation ranks for AER's nine comparator firms

Company name	Ticker	End-of-sample month	Rank
Alinta	AAN	August 2007	57
AGL Energy Limited	AGL	October 2006	30
APA Group	APA	June 2013	58
DUET Group	DUE	June 2013	106
Envestra Limited	ENV	June 2013	124
GasNet	GAS	November 2006	302
Hastings Diversified Fund	HDF	November 2012	134
Spark Infrastructure	SKI	June 2013	108
SP AusNet	SPN	June 2013	71

Source: Ranks are from SIRCA's SPPR database.

[63] AER, *Final decision Electricity transmission and distribution network service providers: Review of the weighted average cost of capital (WACC) parameters*, May 2009, pages 80 and 105.

[64] SIRCA Australian Share Price and Price Relative (SPPR) information supplied by RoZetta Technology Pty Ltd (www.rozettatechnology.com).

[65] Henry, O., *Estimating β: An update*, University of Liverpool, April 2014.

The AER's position then appears to be that a benchmark efficient entity may be a listed or unlisted entity and that the entity need not be large.

Companies that are not large ASX-listed companies fall into two categories:

- companies that are public companies, but are not large ASX-listed companies; and
- companies that are privately owned.

The ATO's 2011-12 *Taxation Statistics* use data for 296,450 private resident companies and 2,865 public resident companies.[66] Many of the private companies are very small and some of the public companies are very large. A benchmark efficient entity almost surely does not resemble a very small private company and the AER argues that a benchmark efficient entity need not resemble a large, publicly listed company. So the distribution rate for a benchmark efficient entity may – or may not – differ from the distribution rate for the market as a whole.

In recent reports, Handley (2014) and Lally (2014) provide estimates of the distribution rate of public companies and the largest 20 companies listed on the ASX.[67] Lally uses data from the financial statements of the 20 largest ASX-listed companies from 2000-01 to 2012-13 inclusive to compute an estimate of the distribution rate of 0.84. Handley uses ATO data on public companies from 1987-88 to 2010-11 to compute an estimate of the distribution rate of 0.80.

Since we would like to know what an estimate of the distribution rate might be for a public company that is not a large ASX-listed entity, we use ATO data from 2000-01 to 2011-12 and the method that Handley employs to estimate the distribution rate over approximately the same period that Lally examines. Interestingly, we find that an estimate of the distribution rate for public companies computed from ATO data is lower using more recent data than Handley finds is true for the longer period from 1987-88 to 2010-11. In other words, we find evidence that the distribution rate for public companies has fallen.

Like Handley (2014), we use the percentages of net tax paid by private companies and net tax paid by public companies based on earlier editions of the ATO's *Taxation Statistics* to estimate the split of the annual net tax paid data appearing in the most recent edition of *Taxation Statistics* – here the 2011-12 edition.[68]

We compute the net tax that public companies which are not top-20 ASX-listed companies must pay as the difference between the net tax that all public companies pay and the net tax

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66 See Company Table 3 available at:

https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=coy_detailed#coy_detailed

67 Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

68 Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

that Lally (2014) reports that the top 20 ASX-listed companies pay.[69] Similarly, we compute the change in the franking account balances of public companies that are not top-20 ASX-listed companies as the difference between the change in the franking account balances of all public companies and the change in the franking account balances that Lally provides for the top 20 ASX-listed companies.

Table 3.4 below provides the results of our endeavours. The table confirms Handley's (2014) finding that the distribution rate for private companies is around 0.50.[70] On the other hand, the table shows that for the period 2000-01 to 2011-12 the distribution rate for public companies is only 0.75 and so lower than for the period 1987-88 to 2010-11 that Handley examines. Since a weighted average of the distribution rates for top-20 ASX-listed companies and public companies that are not top-20 ASX-listed must match the rate for all public companies, it is not surprising that the distribution rate for public companies that are not top-20 ASX-listed is lower than for all public companies. The distribution rate for public companies that are not top-20 ASX-listed is 0.69.

Table 3.4
Distribution rate by type of company

Firm type	Net tax	Change in franking account balance	Distribution rate
Top-20 ASX-listed	146,279	23,345	0.840
Public but not top-20 ASX-listed	201,025	61,754	0.693
Public	347,304	85,099	0.755
Private	204,812	101,441	0.505
All	566,887	183,846	0.676

Notes: Data for top-20 ASX-listed companies are for the period 2000-01 to 2012-13 and are from Lally (2014). Data for public, private and all companies are for the period 2000-01 to 2011-12. Estimates for public but not top-20 ASX-listed companies use data from 2000-01 to 2012-13. Net tax and franking account balances are in billions of dollars. The change in the franking account balance is the difference between the end-of-period and start-of-period franking account balances. Data for public and private companies are: for net tax, from Company Table 2E (2000-01 to 2009-10), Table 3E (2010-11) and Table 3 (2011-12); for franking account balances, from Company Table 2E (1999-2000) and Table 3 (2011-12) of the ATO's Taxation Statistics. Data for all companies together are from the ATO's Taxation Statistics 2010-11, Company Tax: Table 1 and Taxation Statistics 2011-12, Company Tax: Table 1.

Lally, M., Review of submissions to the QCA on the MRP, risk-free rate and gamma, Victoria University, Wellington, March 2014.

[69] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[70] Handley, J.C., *Report prepared for the Australian Energy Regulator: Advice on the value of imputation credits*, University of Melbourne, September 2014.

Lally (2014) uses data from 2000-01 to 2012-13 while we use data from 2000-01 to 2011-12. [71] So some adjustment should be made to his data in computing an estimate of the net tax of public companies that are not top-20 ASX-listed companies, and when calculating the change in franking account balances of these companies. We examine the impact of adjusting his data by multiplying his net tax and franking account balance figures by 12/13 (because he uses 13 years whereas we use 12) and find that an estimate of the distribution rate for a public company that is not a top-20 ASX-listed company rises to 0.70.

Again, the AER's position appears to be that a benchmark efficient entity may be a listed or unlisted entity and that the entity need not be large. Armed with this view of what type of company a benchmark efficient entity should resemble, it is difficult to see from Table 3.4 that there is a strong case for setting the distribution rate to be any different than the value chosen in the past of 0.70. Suppose, for example, that there is a probability of 20 per cent that the benchmark efficient entity is privately owned, a probability of 60 per cent that the benchmark is a public company that is not a top-20 ASX-listed company and a probability of 20 per cent that the benchmark is a top-20 ASX-listed company. Then an estimate of the distribution rate for the benchmark using our estimates and the estimate that Lally (2014) provides would be $0.20 \times 0.50 + 0.60 \times 0.70 + 0.20 \times 0.84 = 0.69$. [72]

Again, we note that while the distribution rate should, in principle, be a firm specific parameter, the AER states in its *Rate of Return Guideline* that: [73]

> 'We propose that gamma be set with regard to a benchmark efficient entity informed by market wide behaviour rather than with regard to industry or firm specific values.'
>
> 'Estimating the utilisation rate on a market-wide basis is consistent with our interpretation of the nature of this parameter in the Officer framework.'
>
> 'We prefer to estimate the payout ratio on *a market-wide* basis given the likely problems presented by estimating it on either a firm-specific or industry-wide basis.'

[The emphasis is ours]

We estimate the cumulative *market-wide* distribution rate at the end of the 2011-12 financial year to be 0.68 and the average annual *market-wide* distribution rate since 2000-01 to be 0.67. The average annual market-wide distribution rate since 2000-01 is the mean of the annual estimates that appear in Table 3.2 from 2001-01 to 2011-12.

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[71] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[72] Lally, M., *Review of submissions to the QCA on the MRP, risk-free rate and gamma*, Victoria University, Wellington, March 2014.

[73] AER, *Explanatory Statement Rate of Return Guideline*, December 2013, pages 159 and 164.

4. Estimates of the Redemption Rate

In this section we determine the rate at which imputation credits distributed are redeemed and the rate at which credits created are redeemed. We emphasise again that the rate at which credits, created or distributed, are redeemed will not provide an unbiased estimate of the value placed by a representative investor on a dollar of credits, created or distributed. In other words, the redemption rate may provide a very misleading guide as to the impact of credits on the return that the market requires on equity – although it is in this impact that our interest ultimately lies. The rate at which credits, created or distributed, are redeemed, though, should provide an upper bound on the value placed by a representative investor on a dollar of credits, created or distributed. This upper bound may be useful in assessing whether estimates of the value placed by a representative investor on a dollar of franking credit satisfy Rule 74 (2) of the National Gas Rules, which relates generally to forecasts and estimates and states that: [74]

(2) A forecast or estimate:

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

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

The government introduced a simplified imputation system on 1 July 2002 and Hathaway (2010) notes that the taxation statistics that the ATO provides for the years immediately surrounding the introduction of the system have been revised significantly a number of times.[75] For this reason, Hathaway recommends that in estimating the redemption rate from taxation statistics, one should restrict one's attention to data from 2003-04 onwards. We follow his advice. In addition, Hathaway (2013) notes that: [76]

> 'The tax data of the ATO is the most likely to be accurate – after all what other tax data is there but tax collections by the ATO?'
>
> '(T)he FAB data is the more likely of the two sources (dividends and franking account balances) to be reliable. Companies have to record flows into and out of their FAB according to distributions and receipts. One company's credit to the FAB from franked dividend income is another company's debit. On the other hand, dividend data by the ATO can be an unreliable quantum.'

Because the tax data are the most likely to be accurate, we use ATO data on net tax and franking account balances rather than ATO dividend data to estimate the rate at which credits distributed are redeemed. We find that:

- using ATO data an estimate of the rate at which credits distributed are redeemed over the period 2003-04 to 2011-12 is 0.45.

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[74] Australian Energy Market Commission, *National Gas Rules Version 25*, page 54.

[75] Hathaway, N., 2010, *Imputation credit redemption: ATO data 1988-2008*, July 2010.

[76] Hathaway, N., *Imputation credit redemption ATO data 1988-2011: Where have all the credits gone*? Capital Research, September 2013, page 23.

We also find that:

- ATO data imply that the rate at which credits created are redeemed over the period 2003-04 to 2011-12 is 0.31. Recall that credits created are not necessarily distributed.

This result does not suggest that gamma be set to 0.31 because the rate at which credits that have been created are redeemed will not provide an unbiased estimate of the value placed by a representative investor on a dollar of credits created. The result does suggest, however, that 0.31 can be treated as an upper bound on a value for gamma.

4.1. The Flow of Credits to Entities

Imputation credits flow from companies to trusts, persons, funds, charities, non-residents and other companies and also from trusts to companies, persons, funds, charities, non-residents and other trusts. Figure 4.1, based on Figure 4 of a report written by Hathaway (2010), illustrates this flow of credits.[77] Credits are redeemed by persons, funds and charities. They are also redeemed by companies that are life offices, endorsed income tax exempt entities and deductible gift recipients.[78] In Figure 4.1 we label these companies life offices for short. Companies that are not life offices, endorsed income tax exempt entities or deductible gift recipients do not redeem credits. Also, most, albeit not all, non-residents find little value in the credits that they receive and so, like Hathaway, we label the credits that they receive as being largely extinguished.

Determining from the ATO's *Taxation Statistics* the imputation credits that flow to and are redeemed by persons, funds and charities is straightforward. Less straightforward is the task of determining what credits distributed by companies are recycled and what credits flow to life offices, endorsed income tax exempt entities or deductible gift recipients and are redeemed. A full description of how we determine what credits are recycled and what credits flow to life offices, endorsed income tax exempt entities or deductible gift recipients and are redeemed is contained in Appendix B.

4.2. Estimates of the Redemption Rate

Table 4.1 below shows the imputation credits that are recycled by companies, the credits that are redeemed by life offices, endorsed income tax exempt entities and deductible gift recipients, the credits that are redeemed by persons, the credits that are redeemed by funds and the credits that are redeemed by charities. The table indicates that an estimate of the credits that are recycled by companies over the period 2003-04 to 2011-12 is $82,841 million.

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[77] Hathaway, N., 2010, *Imputation credit redemption: ATO data 1988-2008*, July 2010.

[78] An endorsed income tax exempt entity is an entity that is exempt from paying income tax but is entitled to receive a refund of franking credits on franked dividends that it receives. A deductible gift recipient is an entity or fund that can receive tax deductible gifts and is entitled to receive a refund of franking credits on franked dividends that it receives.

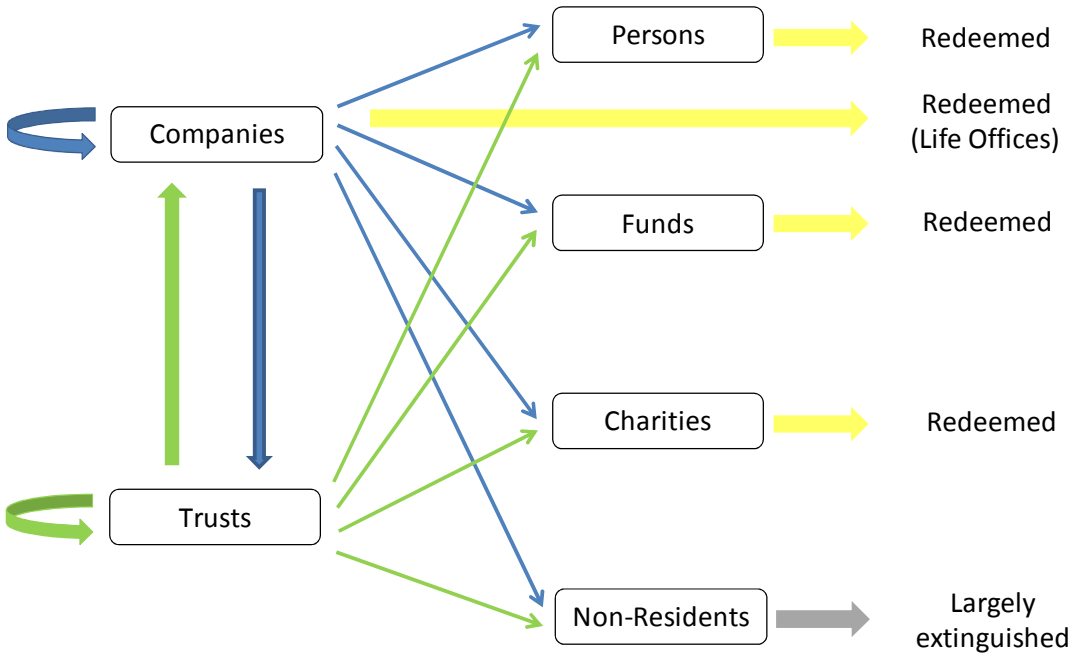
http://www.abn.business.gov.au/HelpTaxConcessions.aspx

http://abr.business.gov.au/DgrListing.aspx

https://www.ato.gov.au/Non-profit/Franking-credits/In-detail/FAQs/Refund-of-franking-credits-frequently-asked-questions-2013-2014/?page=3

Table 4.1 also indicates that an estimate of the credits that are redeemed by life offices, endorsed income tax exempt entities, deductible gift recipients, persons, funds and charities over the period 2003-04 to 2011-12 is $149,538 million.

Figure 4.1
The flow of credits



Note: Based on Figure 4 from Hathaway, N., 2010, Imputation credit redemption: ATO data 1988-2008, July 2010.

From section 3, net company tax paid from 2003-04 to 2011-12 inclusive was $479,777 million while franking account balances grew by $145,583 million over the same period. It follows that an estimate of the rate at which credits distributed were redeemed over the period from 2003-04 to 2011-12 is provided by the following expression that uses data on net tax and franking account balances: [79]

$$\frac{CREDITS\ REDEEMED}{NET\ TAX - \Delta FAB} = \frac{149,538}{479,777 - 145,583} = 0.45 \qquad (12)$$

Finally, the net tax data imply that the rate at which credits created are redeemed over the period 2003-04 to 2011-12 is:

[79] The change in the franking account balance over the period from 2003-04 to 2011-12 is the franking account balance at the end of 2011-12 of $245,702 million less the balance at the end of 2002-03 (start of 2003-04) of $100,119 million.

$$\frac{CREDITS\ REDEEMED}{NET\ TAX} = \frac{149,538}{479,777} = 0.31 \quad (13)$$

This result does not suggest that gamma be set to 0.31 because the rate at which credits created are redeemed may provide a very misleading guide as to the value placed by a representative investor on a dollar of credits created. The result does suggest, however, that 0.31 can be treated as an upper bound on a value for gamma. In other words, the result does suggest that an estimate of gamma should be set no higher than 0.31.

Table 4.1
Imputation credits distributed from 2003-04 to 2011-12

Recipient	Row or source	Amount
Companies for which franking credits are non-refundable	Table B.5	82,841
Life offices, endorsed income tax exempt entities and deductible gift recipients	Table B.5	8,795
Persons	100 + 307	94,277
APRA regulated and other funds	167 + 189	25,504
Self-managed funds	134 + 156	16,408
Charities	16	4,554
Credits redeemed		149,538

Notes: All data are in millions of dollars.

The company data are from Company Tax: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012company1selecteditemsbyyear.xls'. [80]

The personal data are from Individuals Tax: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012individual01selecteditemsbyyear.xls'. [81]

The data for APRA regulated and other funds are from Fund Tax: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012fund1apraselecteditemsbyyear.xls'. [82]

The data for self-managed funds are from Fund Tax: Table 2 for 2011-12, which can be found in the workbook 'taxstats2012fund2smsfselecteditemsbyyear.xls'. [83]

The data for charities are from Charities and Deductible Gifts: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012charities1refundablefrankingcredits.xls'. [84]

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80 https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=coy_detailed#coy_detailed

81 https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=indiv_detailed#indiv_detailed

82 https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=superfunds_detailed#superfunds_detailed

83 https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=superfunds_detailed#superfunds_detailed

Appendix A. The Redemption Rate and Theta

This appendix provides a derivation of a simple version of the model that Officer suggests that one can use to compute the return required on equity.

Again, each investor seeks to minimise: [85]

$$\frac{\varphi}{2}\sigma^2(W_{1j}) - \mathrm{E}(W_{1j}) \tag{A.1}$$

where φ is a measure of the risk aversion of each investor and the end-of-period wealth of investor j is given by: [86]

$$W_{1j} = 1 + x_{1j}(r_1 + \theta_j c_1) + x_{2j} r_2 + (1 - x_{1j} - x_{2j}) r_f \tag{A.2}$$

Asset 1 is the domestic risky asset which delivers imputation credits while asset 2 is the foreign risky asset which delivers no credits.

We assume that imputation credits can be redeemed immediately and so for domestic investors $\theta_j = 1$ while for foreign investors $\theta_j = 0$.

There are *D* domestic investors and *F* foreign investors and start-of-period wealth for each investor is one dollar.

A.1. Interpretation of Theta

The first-order conditions for each domestic investor are:

$$\mathrm{E}(r_i) + c_i - r_f = \varphi \mathrm{Cov}(r_i, W_{1j}), \quad i = 1, 2 \tag{A.3}$$

while the first-order conditions for each foreign investor are:

$$\mathrm{E}(r_i) - r_f = \varphi \mathrm{Cov}(r_i, W_{1j}), \quad i = 1, 2 \tag{A.4}$$

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[84] https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=cdg_detailed#cdg_detailed

[85] Ingersoll (1987) shows that if the returns to the two risky assets are bivariate normal, then an investor who displays constant absolute risk aversion of φ will seek to minimise the quantity (A.1).

Ingersoll, J., 1987, *Theory of financial decision making*, Rowman and Littlefield, page 98.

[86] Recall that:

x_{ij}	=	the weight placed by investor j in the risky asset i;
r_i	=	the return to risky asset i;
θ_j	=	the value placed by investor j on a one dollar tax credit;
c_1	=	the credit yield attached to asset 1 – assumed to be known at the start of the period; and
r_f	=	the risk-free rate.

Using (A.3) and (A.4) and aggregating over all investors yields:

$$(D+F)\left(\mathrm{E}(r_1)-r_f\right)+Dc_1=\varphi\mathrm{Cov}(r_1,W_{1m}) \tag{A.5}$$

and

$$(D+F)\left(\mathrm{E}(r_2)-r_f\right)=\varphi\mathrm{Cov}(r_2,W_{1m}) \tag{A.6}$$

where end-of-period world wealth is given by:

$$W_{1m}=\sum_j W_{1j}=(D+F)+\sum_j x_{1j}(r_1+\theta_j c_1)+\sum_j x_{2j}r_2+\sum_j(1-x_{1j}-x_{2j})r_f \tag{A.7}$$

Define the credit yield of the world market portfolio of risky assets to be:

$$c_m=\left(\sum_j(x_{1j}+x_{2j})\right)^{-1}\sum_j x_{1j}c_1 \tag{A.8}$$

and the return on the world market portfolio of risky assets to be:

$$r_m=\left(\sum_j(x_{1j}+x_{2j})\right)^{-1}\sum_j(x_{1j}r_1+x_{2j}r_2) \tag{A.9}$$

Then from (A.5), (A.6), (A.7) and (A.9):

$$\mathrm{E}(r_i)+\theta c_i-r_f=\beta_i\left(\mathrm{E}(r_m)+\theta c_m-r_f\right),\qquad i=1,2, \tag{A.10}$$

where c_i is the credit yield of risky asset i and:

$$\theta=\frac{D}{D+F} \tag{A.11}$$

measures the impact of imputation credits distributed on the return required on domestic equity. θ is the value placed on a dollar of tax credits by a representative investor. If there are few domestic investors relative to foreign investors, the representative investor will most closely resemble a foreign investor and the impact of imputation credits distributed on the return required on domestic equity will be negligible as, in the model, a foreign investor places no value on credits received.

A.2. Relation between Redemption Rate and Theta

Solving the first-order conditions (A.3) for the weights placed by each domestic investor in each risky asset yields:

$$\begin{pmatrix} x_{1j} \\ x_{2j} \end{pmatrix} = \varphi^{-1} \begin{pmatrix} \sigma^2(r_1) & \mathrm{Cov}(r_1, r_2) \\ \mathrm{Cov}(r_1, r_2) & \sigma^2(r_2) \end{pmatrix}^{-1} \begin{pmatrix} \mathrm{E}(r_1) + c_1 - r_f \\ \mathrm{E}(r_2) - r_f \end{pmatrix}$$

$$= \varphi^{-1} \left(\sigma^2(r_1)\sigma^2(r_2) - \left(\mathrm{Cov}(r_1, r_2)\right)^2 \right) \begin{pmatrix} \sigma^2(r_2)\left(\alpha_{12} + c_1\right) \\ \sigma^2(r_1)\alpha_{21} - \sigma^2(r_1)\beta_{21}c_1 \end{pmatrix} \qquad \text{(A.12)}$$

while solving the first-order conditions (A.4) for the weights placed by each foreign investor in each risky asset yields:

$$\begin{pmatrix} x_{1j} \\ x_{2j} \end{pmatrix} = \varphi^{-1} \begin{pmatrix} \sigma^2(r_1) & \mathrm{Cov}(r_1, r_2) \\ \mathrm{Cov}(r_1, r_2) & \sigma^2(r_2) \end{pmatrix}^{-1} \begin{pmatrix} \mathrm{E}(r_1) - r_f \\ \mathrm{E}(r_2) - r_f \end{pmatrix}$$

$$= \varphi^{-1} \left(\sigma^2(r_1)\sigma^2(r_2) - \left(\mathrm{Cov}(r_1, r_2)\right)^2 \right) \begin{pmatrix} \sigma^2(r_2)\alpha_{12} \\ \sigma^2(r_1)\alpha_{21} \end{pmatrix}, \qquad \text{(A.13)}$$

where:

$$\alpha_{12} = \mathrm{E}(r_1) - r_f - \beta_{12}\left(\mathrm{E}(r_2) - r_f\right), \qquad \beta_{12} = \frac{\mathrm{Cov}(r_1, r_2)}{\sigma^2(r_2)},$$

$$\alpha_{21} = \mathrm{E}(r_2) - r_f - \beta_{21}\left(\mathrm{E}(r_1) - r_f\right), \qquad \beta_{21} = \frac{\mathrm{Cov}(r_1, r_2)}{\sigma^2(r_1)} \qquad \text{(A.14)}$$

α_{12} is the alpha (exclusive of credits) of the domestic risky asset (risky asset 1) relative to the foreign risky asset (risky asset 2). This alpha measures the benefit to a foreign investor of holding the domestic risky asset.

α_{21} is the alpha (exclusive of credits) of the foreign risky asset (risky asset 2) relative to the domestic risky asset (risky asset 1). This alpha measures the benefit to a foreign investor of holding the foreign risky asset.

The rate at which credits distributed are redeemed will be given by the ratio of domestic holdings of the domestic risky asset (risky asset 1) to the sum of domestic and foreign holdings of the asset. From (A.12) and (A.13) this ratio will be given by:

$$\frac{D + D\alpha_{12}^{-1}c_1}{D + F + D\alpha_{12}^{-1}c_1}, \qquad \text{(A.15)}$$

From (A.13), if $\alpha_{12} > 0,$ then the foreign investor will hold a long position in the domestic risky asset. Under these circumstances, the redemption rate given by (A.15) will lie between θ and one and so the redemption rate will provide an upper bound for the parameter θ. The gap between the redemption rate and θ will be large, however, if the benefit to a foreign

investor of holding the domestic risky asset is small relative to the credit yield of the domestic risky asset. Suppose, for example that $D = 2, F = 98, \alpha_{12} = 0.0002$ and $c_1 = 0.02$. That is, suppose that the domestic population makes up 2 per cent of the world's population, there is little benefit to a foreign investor to investing in the domestic risky asset relative to investing in the foreign risky asset and the credit yield attached to the domestic risky asset is 2 per cent. Then $\theta = 2 \div (2 + 98) = 0.02$ and the redemption rate will be $(2 + 2 \times 0.0002^{-1} \times 0.02) \div (2 + 98 + 2 \times 0.0002^{-1} \times 0.02) = 0.67$, that is, substantially larger.

If $\alpha_{12} = 0,$ then the foreign investor will not hold a position in the domestic risky asset. Under these circumstances, the redemption rate given by (A.15) will match θ and so the redemption rate will again provide an upper bound for the parameter θ.

If $\alpha_{12} < 0,$ then the foreign investor will hold a short position in the domestic risky asset. Under these circumstances, the redemption rate given by (A.15) will lie above one. The model is not well equipped to analyse a situation of this kind, however, because the model presumes that a foreign investor who shorts the domestic risky asset does not have to supply credits to the domestic investor who holds the asset long.

Appendix B. Computational Details

This appendix provides a full description of how we compute:

- net tax, appropriately adjusted, for each year;
- the franking credits received by companies for which franking credits are non-refundable for each year; and
- the franking credits received by life offices, endorsed income tax exempt entities and deductible gift recipients each year.

B.1. Adjusting net tax

B.1.1. Aggregated data

The 2011-12 Company Tax Table 1 that the ATO provides reports net tax computed in one way for the years 1987-88 to 2008-09 and in another way for the years 2009-10 to 2011-12. As the ATO makes clear:[87]

> 'Net tax has a new definition. The new definiton (sic) no longer deducts refundable credits, i.e. new Net tax = gross tax less non-refundable tax offsets.'

The ATO says about the old definition of net tax that: [88]

> 'Net tax does not equate to total tax payable. After the net tax is calculated, PAYG instalments and other credits are applied and any R&D tax offset is credited to give total tax payable or refundable.'

The data for the R&D tax offset that the ATO provides first appear in 2002-03 and the data for the old definition of net tax end in 2008-09. So for the years 1987-88 to 2001-02 we use the old definition of net tax (row 408 of 2011-12 company workbook) while for the years 2002-03 to 2008-09 we use the difference between the old definition of net tax and the R&D tax offset (row 396 of the same workbook). In our 2013 report for the ENA, we neglected to adjust for the R&D tax offset. [89] The impact of the adjustment is to marginally lower an estimate of the distribution rate. R&D offsets provided from 2002-03 to 2010-11 total just 3,458 million dollars against total net tax, appropriately adjusted, of 778,157 million dollars from 1987-88 to 2011-12. The franking account balance as of the end of 2011-12 is 245,702 million dollars. So from (10), subtracting the R&D tax offset from net tax over the period 2002-03 to 2010-11 reduces the cumulative distribution rate by 13 basis points.

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87 See the worksheet 'Company Tax Title and Notes' of the workbook taxstats2012company1selecteditemsbyyear.xls that can be found at:

https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=coy_detailed#coy_detailed

88 ATO, *Taxation statistics 2010-11*, page 38. Available at:

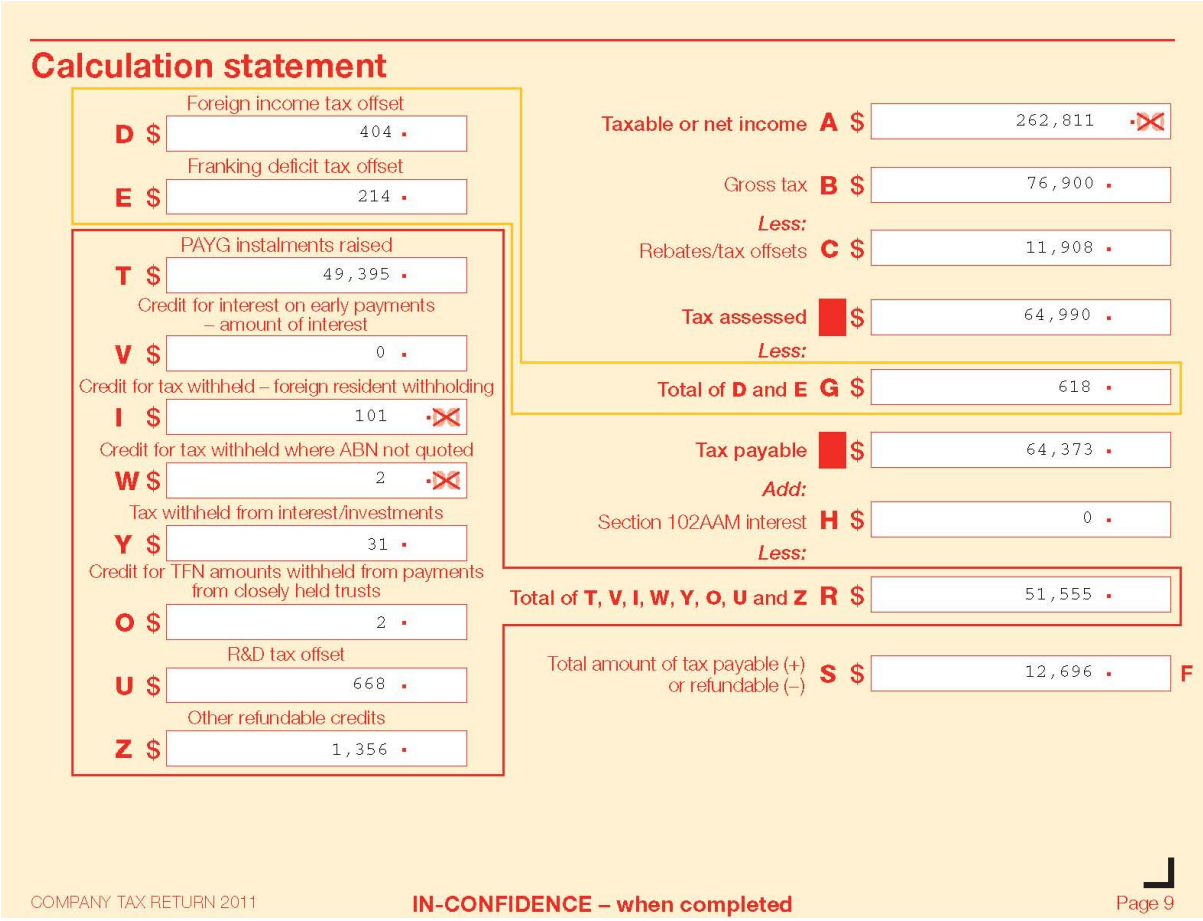
https://www.ato.gov.au/uploadedFiles/Content/CR/Research_and_statistics/In_detail/Downloads/cor00345977_2011TAXSTATS.pdf

89 NERA, *The payout ratio: A report for the Energy Networks Association*, June 2013.

For the years 2009-10 to 2011-12 the ATO provides only data for the new definition of net tax in its 2011-12 company workbook even though it was in 2011-12 that the calculation statement underwent a major change. Table B.1 shows a calculation statement for 2010-11 into which we have entered the aggregate data provided by the ATO for that year in its 2011-12 company workbook. For the years 2009-10 to 2010-11 we compute net tax, appropriately adjusted, as labels S – D – E – U – Z. That is, we compute net tax, appropriately adjusted as tax assessed less foreign income, franking deficit and R&D tax offsets and less other refundable credits. Thus, for the year 2010-11 we compute net tax, appropriately adjusted, in millions of dollars as:

$$ADJUSTED\ NET\ TAX\ (2010-2011) = 64,990 - 404 - 214 - 668 - 1,356 = 62,349 \qquad (B.1)$$

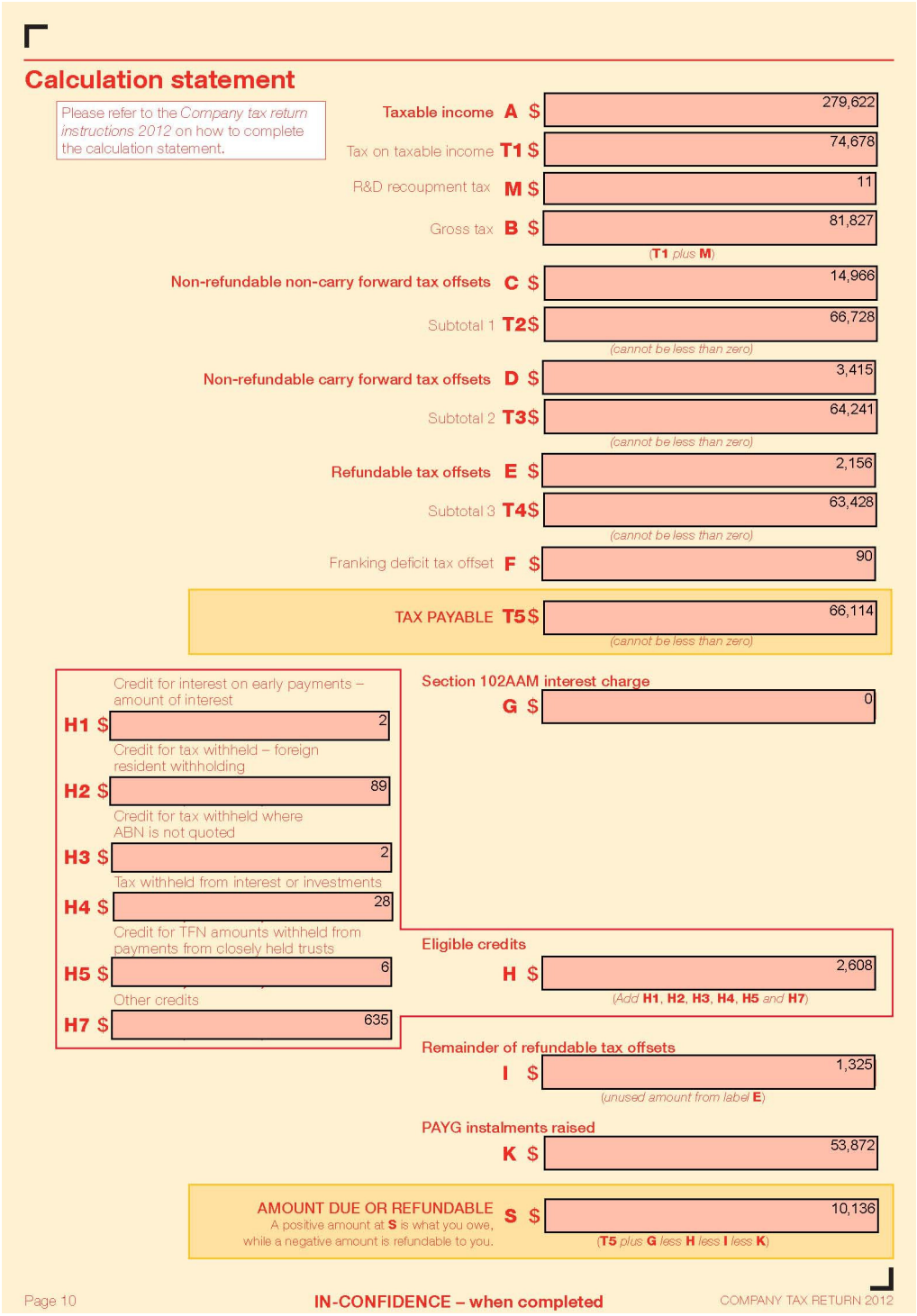
Table B.1
Calculation Statement 2010-11



Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2010-11, which can be found in the workbook cor00345977_2011COM1.xls, except data that appear at labels G, H and S which we compute. [90]

[90] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Table B.2
Calculation Statement 2011-12



Calculation statement

Please refer to the *Company tax return instructions 2012* on how to complete the calculation statement.

Taxable income	A $	279,622
Tax on taxable income	T1 $	74,678
R&D recoupment tax	M $	11
Gross tax	B $	81,827
	(T1 *plus* M)	
Non-refundable non-carry forward tax offsets	C $	14,966
Subtotal 1	T2$	66,728
	(cannot be less than zero)	
Non-refundable carry forward tax offsets	D $	3,415
Subtotal 2	T3$	64,241
	(cannot be less than zero)	
Refundable tax offsets	E $	2,156
Subtotal 3	T4$	63,428
	(cannot be less than zero)	
Franking deficit tax offset	F $	90
TAX PAYABLE	T5$	66,114
	(cannot be less than zero)	

Credit for interest on early payments – amount of interest	H1 $	2
Credit for tax withheld – foreign resident withholding	H2 $	89
Credit for tax withheld where ABN is not quoted	H3 $	2
Tax withheld from interest or investments	H4 $	28
Credit for TFN amounts withheld from payments from closely held trusts	H5 $	6
Other credits	H7 $	635

Section 102AAM interest charge	G $	0
Eligible credits	H $	2,608
	(Add H1, H2, H3, H4, H5 *and* H7)	
Remainder of refundable tax offsets	I $	1,325
	(*unused amount from label* E)	
PAYG instalments raised	K $	53,872
AMOUNT DUE OR REFUNDABLE A positive amount at S is what you owe, while a negative amount is refundable to you.	S $	10,136
	(T5 *plus* G *less* H *less* I *less* K)	

Page 10 IN-CONFIDENCE – when completed COMPANY TAX RETURN 2012

Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2011-12, which can be found in the workbook taxstats2012company1selecteditemsbyyear.xls. [91]

[91] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Table B.2 shows a calculation statement for 2011-12 into which we have entered the aggregate data provided by the ATO for that year in its 2011-12 company workbook.

For the year 2011-12 we compute net tax, appropriately adjusted, as labels T3 – E – F – I. That is, we compute net tax, appropriately adjusted, as subtotal 2 less refundable, franking deficit and remainder of refundable tax offsets. Put another way, we compute net tax, appropriately adjusted, as the new definition of net tax, T3 – F, less refundable tax offsets, E, and remainder of refundable tax offsets, I. Thus, for the year 2011-12 we compute net tax, appropriately adjusted, in millions of dollars as:

$$ADJUSTED\ NET\ TAX\ (2011-2012) = 64,241 - 2,156 - 90 - 1,325 = 60,671 \qquad (B.2)$$

The *Tax Laws Amendment (Research and Development) Act 2011* received royal assent on 8 September 2011. As a result, the R&D tax concession has been replaced by the R&D tax incentive for years of income beginning on or after 1 July 2011. R&D offsets are now included at labels D, E and I of the calculation statement and are not identified separately in the statement. [92]

Table B.3 below shows the rows of the 2012 company workbook from which we extract the relevant data.

Table B.3
Data used to compute net tax, appropriately adjusted

Row	Item	Years
336	Foreign income tax offset	2009-10 to 2010-11
360	Tax assessed	2009-10 to 2010-11
368	Subtotal 2	2011-12
370	Refundable tax offsets	2011-12
374	Franking deficit tax offset	2009-10 to 2011-12
396	R&D tax offset	2002-03 to 2010-11
398	Other refundable credits	2009-10 to 2010-11
402	Remainder of refundable tax offsets	2011-12
408	Net tax (old definition)	1987-88 to 2008-09

Note: The table indicates the row in which the data appear in the ATO's Company Tax: Table 1: Selected items, for income years 1979-80 to 2011-12. [93]

[92] See pages 79-81 of the 2012 Company tax return instructions available at:

https://www.ato.gov.au/uploadedFiles/Content/TPALS/downloads/TP00316151NAT06692012[1].pdf

[93] Company Tax: Table 1 for 2011-12 can be found in the workbook taxstats2012company1selecteditemsbyyear.xls which in turn can be found at:

B.1.2. Disaggregated data

The ATO does not report disaggregated data for the R&D tax offset. So when using disaggregated data we do not subtract the R&D tax offset from net tax in the years 2000-01 to 2010-11. If the data were available, subtracting the tax offset would lower an estimate of net tax and so raise an estimate of the proportion of credits retained and lower an estimate of the proportion of credits distributed. The impact, however, would likely be small. From Table 3.3, an estimate of the distribution rate for all companies for the period 2000-01 to 2011-12, computed by subtracting the R&D tax offset from net tax, is 0.676. An estimate of the distribution rate, computed without subtracting the R&D tax offset from net tax, is 0.678.

B.2. Credits Received by Companies

For life offices, endorsed income tax exempt entities and deductible gift recipients imputation credits are refundable. For companies that are not life offices, endorsed income tax exempt entities or deductible gift recipients, however, imputation credits are non-refundable and cannot be carried forward. While imputation credits cannot be carried forward by these companies, excess credits are not lost because excess franking credits can be converted into a tax loss that can be carried forward.[94]

For companies, for which imputation credits are non-refundable and cannot be carried forward, credits received are entered under 'rebates/tax offsets' at label C in calculation statements before 2011-12 and under 'non-refundable non-carry forward tax offsets' at label C in the calculation statement for 2011-12. Label C in calculation statements before 2011-12 and label C in the calculation statement for 2011-12, however, also include other offsets besides franking credits. So estimating the franking credits included under these labels requires that we remove these other offsets from the totals for the labels. Unfortunately, the ATO does not provide the data necessary to remove all of the other offsets and so we are forced to proceed under the assumption that the data that the ATO does provide are relatively important and the data that the ATO does not provide are relatively unimportant. Table B.4 provides the result of this exercise. We estimate that over the period 2003-04 to 2011-12 companies received $80,082 million as non-refundable credits and we enter the amount in the first row of Table B.5 below that shows the imputation credits received by companies.

The company tax return instructions for years before 2011-12 state that if the total of rebates and tax offsets at label C exceeds gross tax at label B, the rebates and tax offsets entered at label C must be reduced until they match gross tax at label B. Excess franking credits – that is, unused franking credits – are then entered at label H on page 8 of the company tax return. [95] We calculate that $2,759 million dollars of excess franking credits were recorded over the period 2003-04 to 2010-11 and we enter this amount in the second row of Table B.5. The company tax return instructions for 2011-12, on the other hand, do not state that if the

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https://www.ato.gov.au/about-ato/research-and-statistics/in-detail/tax-statistics/taxation-statistics-2011-12/?anchor=coy_detailed#coy_detailed

94 ATO, *Company tax return instructions 2012*, 2012, page 50.

95 That is, label H of page 8 of the company tax return and not label H of the calculation statement.

total of non-refundable non-carry forward tax offsets at label C exceeds gross tax at label B, the amount entered at label C must be reduced until it matches gross tax at label B. Excess franking credits are still entered at label H on page 8 of the company tax return but the instructions imply that these excess franking credits are also contained in the amount entered at label C. So, to avoid double counting, we do not include the excess franking credits recorded at label H on page 8 for the year 2011-12 in row 2 of Table B.5. Adding the first two rows of Table B.5 provides an estimate of the credits that are recycled by companies of $82,841 million.

Table B.4
Inferring from label C of the calculation statement the component that is imputation credits which companies receive

Item	Row	Years	Amount
Australian franking credits from a New Zealand company	118	2003-04 to 2011-12	81
Entrepreneurs tax offset	276	2003-04 to 2011-12	18
Landcare and water facility tax offset brought forward from prior years	332	2009-10 to 2010-11	0
Foreign income tax offset	336	2011-12	457
Rebates/tax offsets	358	2003-04 to 2010-11	65,672
Non-refundable non-carry forward tax offsets	362	2011-12	14,966
Allowable non-refundable franking tax offsets	358 + 362 – 118 – 276 – 332 – 336	2003-04 to 2011-12	80,082

Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012company1selecteditemsbyyear.xls'.[96] *Items for which data are unavailable are:*

- *tax offsets for bonuses and certain other amounts received under short-term life insurance policies taken out after 27 August 1982;*
- *tax offsets for interest on certain government and semi-government securities;*
- *tax offsets to approved resident lenders for infrastructure borrowings; and*
- *offsets for approved heritage conservation expenditure.*

[96] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Table B.5
Imputation credits received by companies

Type	Companies	Labels	Years	Amount
Non-refundable non-carry forward tax offsets	Companies for which franking credits are non-refundable	CS.C	2003-04 to 2011-12	80,082
Excess franking credits	Companies for which franking credits are non-refundable	8H	2003-04 to 2011-12	2,759
Credits recycled				82,841
Refundable tax offsets	Life offices, endorsed income tax exempt entities and deductible gift recipients	CS.Z	2003-04 to 2010-11	6,949
Refundable tax offsets	Life offices, endorsed income tax exempt entities and deductible gift recipients	CS.E, CS.I	2011-12	1,847
Credits redeemed				8,795

Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2011-12, which can be found in the workbook taxstats2012company1selecteditemsbyyear.xls. [97]

For life offices, endorsed income tax exempt entities and deductible gift recipients, for which imputation credits are refundable, credits received are entered under 'other refundable credits' at label Z in calculation statements before 2011-12 and under 'refundable tax offsets' at label E and 'remainder of refundable tax offsets' at label I in the calculation statement for 2011-12. In the 2011-12 statement, offsets entered at label E must be reduced to ensure that subtotal 3 at label T4 is non-negative with the remaining offsets being entered at label I. Label Z in calculation statements before 2011-12 and labels E and I in the 2011-12 statement also include other offsets besides franking credits. So estimating the franking credits included under these labels also requires that we remove other offsets from the totals for the labels. Again, the ATO does not provide the data necessary to remove all of the other offsets and so once more we are forced to proceed under the assumption that the data that the ATO does provide are relatively important, whilst the data that the ATO does not provide are relatively unimportant.

[97] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Table B.6 and Table B.7 provides the result of this exercise for Label Z in calculation statements before 2011-12 and labels E and I in the calculation statement for 2011-12. We estimate that over the period from 2003-04 to 2010-11 franking credits redeemed by life offices, endorsed income tax exempt entities and deductible gift recipients, entered at label Z, were $6,949 million and we enter the amount in the fourth row of Table B.5. We estimate that in the year 2011-12 franking credits redeemed by life offices, endorsed income tax exempt entities and deductible gift recipients, entered at labels E and I, were $1,847 million and we enter the amount in the fifth row of Table B.5. Adding the fourth and fifth rows of Table B.5 provides an estimate of the credits redeemed by life offices, endorsed income tax exempt entities and deductible gift recipients of $8,795 million.

Table B.6
Inferring from label Z of the calculation statement the component that is imputation credits which life offices, endorsed income tax exempt entities and deductible gift recipients receive

Item	Row	Years	Amount
National rental affordability scheme tax offset	280	2008-09 to 2010-11	10
Income tax payable on no-TFN contributions income	326	2010-11	0
Other refundable credits	398	2003-04 to 2010-11	6,959
Refundable franking tax offsets	398 – 280 – 326	2003-04 to 2010-11	6,949

Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2011-12, which can be found in the workbook 'taxstats2012company1selecteditemsbyyear.xls'.[98] *Items for which data are unavailable are:*

- *the total amount of an entitlement to a film tax offset under Division 376 of the ITAA 1997;*
- *for RSA providers, interest on no-TFN tax offset; and*
- *the tax offset available under subsection 713-545(5) of the ITAA 1997 where a life insurance company's subsidiary joins a consolidated or MEC group.*

[98] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Table B.7
Inferring from labels E and I of the calculation statement the component that is imputation credits which life offices, endorsed income tax exempt entities and deductible gift recipients receive

Item	Row	Year	Amount
National rental affordability scheme (tax offset entitlement)	280	2011-12	3
Income tax payable on no-TFN contributions income	326	2011-12	0
Refundable R&D tax offset	346	2011-12	1,632
Refundable tax offsets	370	2011-12	2,156
Remainder of refundable tax offsets	402	2011-12	1,325
Refundable franking tax offsets	370 + 402 – 280 – 326 – 346	2011-12	1,847

Notes: All data are in millions of dollars and are from Company Tax: Table 1 for 2011-12, which can be found in the workbook taxstats2012company1selecteditemsbyyear.xls.[99] *Items for which data are unavailable are:*

- *film tax offsets under Division 376 of the ITAA 1997; and*
- *the tax offset available under subsection 713-545(5) of the ITAA 1997 where a life insurance company's subsidiary joins a consolidated or MEC group.*

[99] https://www.ato.gov.au/About-ATO/Research-and-statistics/Previous-years/Tax-statistics/Taxation-statistics-2010-11/?anchor=Detail_Company_tax_and_the_petroleum_res##Detail_Company_tax_and_the_petroleum_res

Appendix C. Terms of Reference

Expert Terms of Reference

Estimating distribution and redemption rates from taxation statistics

Jemena Gas Networks
2015-20 Access Arrangement Review

AA15-570-0073 **10 March 2015**

1. Background

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

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

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

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

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

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

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

> "(2) A service provider should be provided with a reasonable opportunity to recover at least the efficient costs the service provider incurs in—

(a) providing reference services; and

(b) complying with a regulatory obligation or requirement or making a regulatory payment.

(3) A service provider should be provided with effective incentives in order to promote economic efficiency with respect to reference services the service provider provides. The economic efficiency that should be promoted includes—

(a) efficient investment in, or in connection with, a pipeline with which the service provider provides reference services…

[…]

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

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

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

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

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

(2) A forecast or estimate:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Return on equity

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

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

[Subrules (8)–(19) omitted].

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

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

> "The estimated cost of corporate income tax of a service provider for each regulatory year of an access arrangement period (ETC_t) is to be estimated in accordance with the following formula:
>
> $ETC_t = (ETIt \times r_t)\ (1 - \gamma)$
>
> Where
>
> ETI_t is an estimate of the taxable income for that regulatory year that would be earned by a benchmark efficient entity as a result of the provision of reference services if such an entity, rather than the service provider, operated the business of the service provider;
>
> r_t is the expected statutory income tax rate for that regulatory year as determined by the AER; and
>
> γ is the value of imputation credits."

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

The value of imputation credits is conventionally estimated as the product of the distribution rate and theta (representing the value of distributed credits).

In its draft decision on JGN's Access Arrangement proposal (published November 2014) the AER considered estimates of the distribution rate and theta based on tax statistics. The AER concluded that:

- tax statistics support a value of 0.7 for the distribution rate for all equity (including listed and unlisted equity);
- tax statistics support an estimate of theta between 0.4 and 0.6, although the AER's estimate of the distribution rate implies that it should adopt a value around 0.43. The AER concluded that an estimate of 0.43 is consistent with its estimate of the distribution rate across all equity of 0.7;

The AER's estimate of theta from tax statistics was based on the observed imputation credit redemption rate – that is, the proportion of distributed imputation credits that are redeemed. The AER's estimate of the distribution rate was also from tax statistics.

In this context, the independent opinion of NERA, as a suitably qualified independent expert (**Expert**), is sought on imputation credit redemption rate estimates from tax statistics. JGN seeks this report on behalf of itself, Jemena Electricity Networks, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Ergon Energy, Powercor, SA Power Networks, and United Energy.

2. Scope of Work

The Expert will provide an opinion report that:

1. Reviews and responds, where appropriate, to matters raised in the draft decision on distribution and redemption rates estimated from tax statistics, including (but not limited to):
   (a) the reliability of these estimates; and

(b) any issues of consistency between estimates of the distribution rate and redemption rate.

2. In light of Expert's opinion on the above matters, and any other matters the Expert considers relevant, sets out the Expert's best estimate of the distribution and redemption rates using tax statistics in the context of the relevant regulatory frameworks.

In preparing the report the Expert will:

A. consider any comments raised by the AER and other regulators, and experts engaged by those regulators on (a) the best estimate of redemption from tax statistics; and (b) the role of redemption rates when estimating the value of theta; and

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

3. Information to be Considered

The Expert is also expected to consider the following information:

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

4. Deliverables

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

- is of a professional standard capable of being submitted to the AER;
- is prepared in accordance with the Federal Court Practice Note on Expert Witnesses in Proceedings in the Federal Court of Australia (CM 7) set out in Attachment 1, and includes an acknowledgement that the Expert has read the guidelines [100];
- contains a section summarising the Expert's experience and qualifications, and attaches the Expert's curriculum vitae (preferably in a schedule or annexure);

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

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

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

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

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

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

5. Timetable

The Expert will deliver the final report to Jemena Regulation by **27 March 2015**.

6. Terms of Engagement

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

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

Appendix D. Federal Court Guidelines

FEDERAL COURT OF AUSTRALIA

Practice Note CM 7

EXPERT WITNESSES IN PROCEEDINGS IN THE FEDERAL COURT OF AUSTRALIA

Practice Note CM 7 issued on 1 August 2011 is revoked with effect from midnight on 3 June 2013 and the following Practice Note is substituted.

Commencement

1. This Practice Note commences on 4 June 2013.

Introduction

2. Rule 23.12 of the Federal Court Rules 2011 requires a party to give a copy of the following guidelines to any witness they propose to retain for the purpose of preparing a report or giving evidence in a proceeding as to an opinion held by the witness that is wholly or substantially based on the specialised knowledge of the witness (see **Part 3.3 - Opinion** of the *Evidence Act 1995* (Cth)).

3. The guidelines are not intended to address all aspects of an expert witness's duties, but are intended to facilitate the admission of opinion evidence[101], and to assist experts to understand in general terms what the Court expects of them. Additionally, it is hoped that the guidelines will assist individual expert witnesses to avoid the criticism that is sometimes made (whether rightly or wrongly) that expert witnesses lack objectivity, or have coloured their evidence in favour of the party calling them.

Guidelines

1. General Duty to the Court[102]

1.1 An expert witness has an overriding duty to assist the Court on matters relevant to the expert's area of expertise.

1.2 An expert witness is not an advocate for a party even when giving testimony that is necessarily evaluative rather than inferential.

1.3 An expert witness's paramount duty is to the Court and not to the person retaining the expert.

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[101] As to the distinction between expert opinion evidence and expert assistance see *Evans Deakin Pty Ltd v Sebel Furniture Ltd* [2003] FCA 171 per Allsop J at [676].

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

2. The Form of the Expert's Report[103]

2.1 An expert's written report must comply with Rule 23.13 and therefore must

(a) be signed by the expert who prepared the report; and

(b) contain an acknowledgement at the beginning of the report that the expert has read, understood and complied with the Practice Note; and

(c) contain particulars of the training, study or experience by which the expert has acquired specialised knowledge; and

(d) identify the questions that the expert was asked to address; and

(e) set out separately each of the factual findings or assumptions on which the expert's opinion is based; and

(f) set out separately from the factual findings or assumptions each of the expert's opinions; and

(g) set out the reasons for each of the expert's opinions; and

(ga) contain an acknowledgment that the expert's opinions are based wholly or substantially on the specialised knowledge mentioned in paragraph (c) above[104]; and

(h) comply with the Practice Note.

2.2 At the end of the report the expert should declare that "[the expert] has *made all the inquiries that* [the expert] *believes are desirable and appropriate and that no matters of significance that* [the expert] *regards as relevant have, to* [the expert's] *knowledge, been withheld from the Court*."

2.3 There should be included in or attached to the report the documents and other materials that the expert has been instructed to consider.

2.4 If, after exchange of reports or at any other stage, an expert witness changes the expert's opinion, having read another expert's report or for any other reason, the change should be communicated as soon as practicable (through the party's lawyers) to each party to whom the expert witness's report has been provided and, when appropriate, to the Court[105].

2.5 If an expert's opinion is not fully researched because the expert considers that insufficient data are available, or for any other reason, this must be stated with an indication that the opinion is no more than a provisional one. Where an expert witness who has prepared a report believes that it may be incomplete or inaccurate without some qualification, that qualification must be stated in the report.

2.6 The expert should make it clear if a particular question or issue falls outside the relevant field of expertise.

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[103] Rule 23.13.

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

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

2.7 Where an expert's report refers to photographs, plans, calculations, analyses, measurements, survey reports or other extrinsic matter, these must be provided to the opposite party at the same time as the exchange of reports[106].

3. Experts' Conference

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

J L B ALLSOP
Chief Justice
4 June 2013

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

Appendix E. Curriculum Vitae

Simon M. Wheatley

5 Maple Street
Blackburn VIC 3130
Tel: +61 3 9878 7985
E-mail: swhe4155@bigpond.net.au

Overview

Simon is a consultant and was until 2008 a Professor of Finance at the University of Melbourne. Since 2008, Simon has applied his finance expertise in investment management and consulting outside the university sector. Simon's interests and expertise are in individual portfolio choice theory, testing asset-pricing models and determining the extent to which returns are predictable. Prior to joining the University of Melbourne, Simon taught finance at the Universities of British Columbia, Chicago, New South Wales, Rochester and Washington.

Personal

Nationalities:	U.K. and U.S.
Permanent residency:	Australia

Employment

- Affiliated Industry Expert, NERA Economic Consulting, 2014-
- Special Consultant, NERA Economic Consulting, 2009-2014
- External Consultant, NERA Economic Consulting, 2008-2009
- Quantitative Analyst, Victorian Funds Management Corporation, 2008-2009
- Adjunct, Melbourne Business School, 2008
- Professor, Department of Finance, University of Melbourne, 2001-2008
- Associate Professor, Department of Finance, University of Melbourne, 1999-2001
- Associate Professor, Australian Graduate School of Management, 1994-1999
- Visiting Assistant Professor, Graduate School of Business, University of Chicago, 1993-1994
- Visiting Assistant Professor, Faculty of Commerce, University of British Columbia, 1986

- Assistant Professor, Graduate School of Business, University of Washington, 1984-1993

Education

- Ph.D., University of Rochester, USA, 1986; Major area: Finance; Minor area: Applied statistics; Thesis topic: Some tests of international equity market integration; Dissertation committee: Charles I. Plosser (chairman), Peter Garber, Clifford W. Smith, Rene M. Stulz
- M.A., Economics, Simon Fraser University, Canada, 1979
- M.A., Economics, Aberdeen University, Scotland, 1977

Publicly Available Reports

Empirical performance of Sharpe-Lintner and Black CAPMs: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, AusNet Services, CitiPower, Energex, Ergon Energy, Powercor, SA Power Networks, and United Energy, February 2015, http://jemena.com.au/Gas/Jemena/media/jemenagasnetworksmedia/community-engagement-document/our-revised-regulatory-proposal/Appendix%2007.08%20NERA%20Empirical%20performance%20of%20the%20Sharpe-Lintner%20and%20Black%20CAPMs%20-%2026%20Feb%2015.pdf

Historical estimates of the market risk premium: A report for Jemena Gas Networks, Jemena Electricity Networks, ActewAGL, Ausgrid, AusNet Services, Australian Gas Networks, CitiPower, Endeavour Energy, Energex, Ergon, Essential Energy, Powercor, SA Power Networks and United Energy, February 2015, http://jemena.com.au/Gas/Jemena/media/jemenagasnetworksmedia/community-engagement-document/our-revised-regulatory-proposal/Appendix%2007.07%20NERA%20Historical%20estimates%20of%20the%20MRP%20-%2013%20Feb%2015.pdf

Robust regression techniques: A report for DBP, December 2014, https://www.erawa.com.au/cproot/13287/2/Submission%2012%20-%20Appendix%20F%20-%20Robust%20Regression.PDF

Imputation Credits and Equity Returns: A report for the Energy Networks Association, October 2013, http://www.aer.gov.au/sites/default/files/ENA,%20Attachment%204%20-%20NERA%20Report%20-%20Imputation%20Credits%20and%20Equity%20Prices,%20Submission%20to%20draft%20AER%20rate%20of%20return%20guideline%20-%2011%20Oct%202013.pdf

The Fama-French Three-Factor Model: A report for the Energy Networks Association, October 2013, http://www.aer.gov.au/sites/default/files/Essential%20Energy%20-%20Attachment%207.9_NERA_The%20Fama-French%20Three-Factor%20Model%20-%202014.pdf

The Market Risk Premium: Analysis in Response to the AER's Draft Rate of Return Guidelines: A report for the Energy Networks Association, October 2013, http://www.aer.gov.au/sites/default/files/ENA,%20Attachment%203%20-%20NERA%20Report%20-

%20The%20Market%20Risk%20Premiuml,%20Submission%20to%20draft%20AER%20rate%20of%20return%20guideline%20-%2011%20Oct%202013.pdf

The Market, Size and Value Premiums: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%2015%20-%20ENAMRPReport28062013%20Final.pdf

Estimates of the Zero-Beta Premium: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%202%20-%20Black%20CAPM%20Zero%20Beta%20Estimate%20(Final)%20-%2027%20June..pdf

The Payout Ratio: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%2012%20-%20Payout%20Ratio%20(Final)%20-%20June%202013.pdf

Review of Cost of Equity Models: A report for the Energy Networks Association, June 2013, http://www.aer.gov.au/sites/default/files/Report%201%20-%20Alternative%20Cost%20of%20Equity%20Models%20(Final)%20-%2026%20June.pdf

The Cost of Equity for a Regulated Energy Utility: A Response to the QCA Discussion Paper on the Risk-Free Rate and the MRP: A report for United Energy and Multinet Gas, March 2013, http://www.qca.org.au/files/CI-UEM-SubNERA-CCR1213-0413.pdf

The Cost of Equity for a Regulated Energy Utility: A report for Multinet, February 2013, http://www.erawa.com.au/cproot/11197/2/20130312%20-%20D103642%20-%20Guidelines%20for%20the%20Rate%20of%20Return%20for%20Gas%20Transmission%20and%20Distribution%20Networks%20-%20United%20Energy%20and%20Multinet%20Gas.pdf

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The Market Risk Premium: A report for CitiPower, Jemena, Powercor, SP AusNet and United Energy, 20 February 2012, http://www.aer.gov.au/content/item.phtml?itemId=752660&nodeId=fe0280e7e2113c467dfc4b3b076e1623&fn=Vic%20DNSPs%20(NERA)%20-%2020%20February%202012.pdf

Cost of Equity in the ERA DBNGP Draft Decision: A report for DBNGP, 17 May 2011, http://www.erawa.com.au/cproot/9669/2/20110620%20-%20DBNGP%20(WA)%20%20-%20Sub%2055%20-%20Att%207%20-%20NERA%20Economic%20Consulting%20Cost%20of%20equity%20in%20the%20draft%20decision.pdf

The Market Risk Premium: A report for Multinet Gas and SP AusNet, 29 April 2011, http://www.aer.gov.au/content/index.phtml/itemId/745782

Cost of Capital for Water Infrastructure Company Report for the Queensland Competition Authority, 28 March 2011, http://www.qca.org.au/files/W-NERA-EconomicConsulting-FinalReport-WACC-0411.pdf

The Cost of Equity: A report for Orion, 2 September 2010, http://www.comcom.govt.nz/assets/Pan-Industry/Input-Methodologies/Draft-Reasons-Papers/Draft-Reasons-EDBs/Draft-Determination-X-Sub/Orion-Cross-Submission-Attachment-on-EDBs-and-GPBs-Input-Methodologies-Draft-Determination-and-Reasons-Paper-NERA-Report-2-September-2010.pdf

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The Required Rate of Return on Equity for a Gas Transmission Pipeline: A Report for DBP, 31 March 2010, http://www.erawa.com.au/cproot/8512/2/20100503%20D29252%20DBNGP%20-%20Submission%208%20-%20Annexure%201%20-%20The%20Required%20Rate%20of%20Return%20on%20Equity%20for%20a%20Gas%20Transmission%20Pipeline.pdf

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20of%20equity%20-%20Jemena%20-%20Sandra%20Gamble%20-%2022%20December%202009%20-%20APD%20-%20Website.PDF

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AER's Proposed WACC Statement – Gamma: A report for the Joint Industry Associations, 30 January 2009, http://www.aer.gov.au/content/item.phtml?itemId=726698&nodeId=80cf978278d317e99c34ae1878525573&fn=JIA%20Appendix%20Q%20-%20NERA%20-%20AER's%20proposed%20WACC%20statement-Gamma.pdf

The Value of Imputation Credits: A report for the ENA, Grid Australia and APIA, 11 September 2008, http://www.ena.asn.au/udocs/24092008aersub/Appendix%20K%20-%20The%20value%20of%20imputation%20credits%20-%20NERA.pdf

Consulting Experience

NERA, 2008-present

Lumina Foundation, Indianapolis, 2009

Industry Funds Management, 2010

Academic Publications

Imputation credits and equity returns, (with Paul Lajbcygier), 2012, *Economic Record* 88, 476-494.

Do measures of investor sentiment predict returns? (with Robert Neal), 1998, *Journal of Financial and Quantitative Analysis* 33, 523-547.

Adverse selection and bid-ask spreads: Evidence from closed-end funds (with Robert Neal), 1998, *Journal of Financial Markets* 1, 121-149.

Shifts in the interest-rate response to money announcements: What can we say about when they occur? (with V. Vance Roley), 1996, *Journal of Business and Economic Statistics* 14, 135-138.

International investment restrictions and closed-end country fund prices, (with Catherine Bonser-Neal, Greggory Brauer, and Robert Neal), 1990, *Journal of Finance* 45, 523-547 (reprinted in International Capital Markets Volume III, 2003, G. Andrew Karolyi and Rene M. Stulz, editors, Edward Elgar Publishing, Cheltenham, Glos).

A critique of latent variable tests of asset pricing models, 1989, *Journal of Financial Economics* 21, 177-212.

Some tests of international equity market integration, 1988, *Journal of Financial Economics* 21, 177-212 (reprinted in International Capital Markets Volume I, 2003, G. Andrew Karolyi and Rene M. Stulz, editors, Edward Elgar Publishing, Cheltenham, Glos).

Some tests of the consumption-based asset pricing model, 1988, *Journal of Monetary Economics* 22, 193-215.

Working Papers

An evaluation of some alternative models for pricing Australian stocks (with Paul Lajbcygier), 2009.

Intertemporal substitution, small-sample bias, and the behaviour of U.S. household consumption (with Kogulakrishnan Maheswaran and Robert Porter), 2007.

Keeping up with the Joneses, human capital, and the home-equity bias (with En Te Chen), 2003.

Evaluating asset pricing models, 1998.

Time-non-separable preferences or artifact of temporal aggregation? (with Robert Porter), 2002.

Testing asset pricing models with infrequently measured factors, 1989.

Refereeing Experience

Referee for Accounting and Finance, the Australian Journal of Management, Economic Letters, Financial Analysts Journal, Financial Management, Journal of Accounting and Economics, Journal of Business, Journal of Empirical Finance, Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Financial Economics, Journal of Futures Markets, Journal of International Economics, Journal of International Money and Finance, Journal of Money, Credit, and Banking, Journal of Monetary Economics, Management Science, National Science Foundation, Pacific-Basin Finance Journal, and the Review of Financial Studies.

Program Committee for the Western Finance Association in 1989 and 2000.

Teaching Experience

International Finance, Melbourne Business School, 2008

Corporate Finance, International Finance, Investments, University of Melbourne, 1999-2008

Corporate Finance, International Finance, Investments, Australian Graduate School of Management, 1994-1999

Investments, University of Chicago, 1993-1994

Investments, University of British Columbia, 1986

International Finance, Investments, University of Washington, 1984-1993

Investments, Macroeconomics, Statistics, University of Rochester, 1982

Accounting, 1981, Australian Graduate School of Management, 1981

Teaching Awards

MBA Professor of the Quarter, Summer 1991, University of Washington

Computing Skills

User of SAS since 1980. EViews, Excel, EXP, LaTex, Matlab, Powerpoint, Visual Basic. Familiar with the Australian School of Business, Compustat and CRSP databases. Some familiarity with Bloomberg, FactSet and IRESS.

Board Membership

Anglican Funds Committee, Melbourne, 2008-2011

Honours

Elected a member of Beta Gamma Sigma, June 1986.

Fellowships

Earhart Foundation Award, 1982-1983

University of Rochester Fellowship, 1979-1984

Simon Fraser University Fellowship, 1979

Inner London Education Authority Award, 1973-1977

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NERA
ECONOMIC CONSULTING

NERA Economic Consulting
Darling Park Tower 3
201 Sussex Street
Sydney NSW 2000
Australia
Tel: 61 2 8864 6500 Fax: 61 2 8864 6549
www.nera.com