Review of imputation credits (gamma)

Analysis and Policy Development — Discussion Paper
December 2011
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Invitation for submissions

IPART invites written comment on this document and encourages all interested parties to provide submissions addressing the matters discussed.

Submissions are due by 10 February 2012.

We would prefer to receive them by email <wacc@ipart.nsw.gov.au>.

You can also send comments by fax to (02) 9290 2061, or by mail to:

A&PD – WACC/gamma
Independent Pricing and Regulatory Tribunal
PO Box Q290
QVB Post Office  NSW  1230

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Contents

Invitation for submissions iii
1 Executive Summary 1
  1.1 Structure of this report 2
2 Background 2
  2.1 What are imputation tax credits? 2
  2.2 IPART’s current practice 3
  2.3 Other regulators’ gamma decisions 5
  2.4 Assessment criteria 6
3 Distribution ratio 7
4 Estimation of theta in academic studies 7
  4.1 Theta estimation methodologies 7
  4.2 Dividend drop-off study – Strategic Finance Group (SFG 2011) 11
  Data source and sample 11
  Modelling techniques 12
  Modelling results 12
  Estimation issues of heteroscedasticity and multicollinearity 13
  Assessment of SFG (2011) 14
5 Gamma value in commercial practice 15
6 Regulatory practice 15
  6.1 Recent changes in regulatory practice 15
  6.2 The ACT’s gamma decisions 16
  6.3 Australian regulators’ gamma decisions (post-ACT decision) 17
7 Impact on building block revenue 18
  7.1 The pre-tax WACC model 18
  7.2 The post-tax WACC model 19
8 Assessment of appropriate value of gamma 21
9 Questions to stakeholders 22


1 Executive Summary

IPART is currently undertaking a review of the value of imputation credits (gamma). The review will have regard to more recent evidence on gamma and the current practice of other regulators.

Our preliminary view is that, in a post-tax weighted average cost of capital (WACC) model\(^1\), the value of gamma is 0.25. We also note that, in a post-tax WACC model, gamma is expressed as a point estimate and not as a range.

The value of gamma has the following impact on the notional revenue and prices:

- a decrease in gamma increases the notional revenue and prices
- an increase in gamma decreases the notional revenue and prices.

We currently use a mid-point gamma estimate of 0.4. Our gamma estimate is lower than that used by most of other regulators.

We do not take any changes in the WACC parameters lightly. We recognise that any change in the WACC parameters may have a material impact on:

- businesses, by changing the annual revenue allowances
- customers, by changing prices.

This paper aims to:

- assess the appropriate value of gamma by analysing academic studies and commercial practices
- find out if other regulators changed their gamma after the Australian Competition Tribunal (ACT) decision
- quantify the impact of a change in gamma on the WACC and prices
- assess an appropriate gamma estimate for our future determinations.

This paper carefully assesses the available evidence on gamma, its impact on our gamma estimate and the impact of a change in gamma on businesses and customers.

We invite interested stakeholders to provide us with their views and comments on the issues raised in this paper. The deadline for public submissions is 10 February 2012. Please visit our website for more information.

\(^1\) IPART, *The incorporation of company tax in pricing determinations – Final Decision*, December 2011.
1.1 Structure of this report

Chapter 2 outlines the background of this review, IPART’s current practice and other regulators’ gamma decisions.

Chapter 3 discusses the distribution ratio, which is generally accepted by academic studies and regulators.

Chapter 4 assesses the different methodologies and empirical studies conducted to estimate the utilisation rate (theta).

Chapter 5 discusses the gamma values adopted by commercial practitioners.

Chapter 6 discusses the recent changes in regulatory practice, including the ACT’s gamma decision and other Australian regulators’ gamma decisions.

Chapter 7 shows the impact of using different gamma values on notional revenue and estimates the impacts on our assessment.

Chapter 8 assesses the appropriate value of gamma based on our criteria.

Chapter 9 lists questions we would like to raise with our stakeholders. Stakeholders are welcome to engage with us on any other issues relevant to this review.

2 Background

2.1 What are imputation tax credits?

Under the Australian imputation tax system, shareholders may receive imputation tax credits with dividends. The imputation tax credits can be used to offset tax liabilities. Since July 2000, imputation credits in excess of personal tax liabilities have been available as a cash rebate. International investors cannot utilise imputation credits.

The value of imputation credits, or gamma ($\gamma$), is typically accounted for in the WACC\(^2\). The rationale for including gamma in the WACC is that imputation tax credits provide value to investors by offsetting personal income tax liabilities. Therefore, under an imputation tax system, investors would accept an investment with a lower rate of return than if there were no imputation tax credits.

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\(^2\) Under IPART’s current pre-tax WACC framework, gamma is a WACC parameter. Under a post-tax WACC framework, gamma is not a WACC parameter, but an input into the calculation of tax liabilities.
In a post-tax WACC model, a lower gamma value increases the tax liability, which in turn increases the notional revenue, while a higher gamma value decreases the notional revenue.

The generally accepted regulatory approach has been to define the value of imputation credits as a product of the distribution ratio \( F \) and the utilisation rate \( \theta \): \( \gamma = F \times \theta \), where:

- The distribution ratio \( F \) is defined as the value of imputation credits distributed by a firm as a proportion of the value of imputation credits generated by it in the period.
- The utilisation rate \( \theta \) is defined as the value of imputation credits distributed to investors as a proportion of their face value.
- Theta is 1 for shareholders who can fully utilise imputation credits, such as superannuation funds and resident personal taxpayers. For shareholders who cannot utilise imputation credits, such as non-resident investors, theta is 0.

In our past decisions, we generally determined a gamma value without explicitly looking at separate values for the distribution ratio and the utilisation rate. A summary of our current practice can be found in Section 2.2.

### 2.2 IPART’s current practice

We currently use a gamma range of 0.5 to 0.3 with a midpoint of 0.4. Theoretically, gamma can take on any value between 1 and 0 depending on whether:

- dividends are fully franked and all investors can use all imputation tax credits, in which case gamma would be equal to 1
- dividends are not fully franked and/or investors cannot utilise all of the imputation tax credits, in which case gamma would be between 1 and 0.

There are various sources of information which can be used to estimate the most likely value of gamma. In our past decisions, we used a variety of sources, including academic studies and evidence from financial markets. The latter is important as it helps ensure our decisions have regard to financial market practice and expectations relating to the cost of debt and equity.

When calculating our WACC parameters, we account for uncertainties in the estimate by using a range, rather than a point estimate. We use a domestic version of the capital asset pricing model (CAPM), implying that investors attach at least some value to imputation tax credits.

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3 Distribution ratio is the same as payout ratio.

We recently changed our WACC approach from a pre-tax to a post-tax model. This means that, in future price determinations, gamma will be modelled as part of the tax liability, which is a component of building block revenue and not a parameter of the WACC. We do not use ranges in the input parameters for our building block model. This means that we will use a point estimate of gamma rather than a range in future determinations.

We have considered in the past:

- academic studies, which value gamma between possible values from 0 and 0.72 (Table 2.1)
- the practice of financial experts, who generally ascribe no value to gamma.

### Table 2.1 Empirical estimates of gamma

<table>
<thead>
<tr>
<th>Study</th>
<th>Method</th>
<th>Gamma (^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown &amp; Clarke (1993)</td>
<td>Dividend drop-off</td>
<td>0.72</td>
</tr>
<tr>
<td>Bruckner, Dews &amp; White (1994)</td>
<td>Dividend drop-off</td>
<td>0.69</td>
</tr>
<tr>
<td>Walker &amp; Partington (1999)</td>
<td>Dividend drop-off</td>
<td>0.88 or 0.96</td>
</tr>
<tr>
<td>Hathaway &amp; Officer (1999)</td>
<td>Aggregate tax statistics</td>
<td>0.48</td>
</tr>
<tr>
<td>Hathaway &amp; Officer (1999)</td>
<td>Dividend drop-off</td>
<td>0.44 (all companies)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.49 (large companies)</td>
</tr>
<tr>
<td>Chu &amp; Partington (2008)</td>
<td>Rights issues</td>
<td>N/A(^b)</td>
</tr>
<tr>
<td>Twite &amp; Wood (1997)</td>
<td>Share futures contracts, (1994 to 1995)</td>
<td>0.45</td>
</tr>
<tr>
<td>Hathaway &amp; Officer (2004)</td>
<td>Analysis of tax statistics</td>
<td>0.40</td>
</tr>
<tr>
<td>Cannavan, Finn &amp; Gray (2004)</td>
<td>Inference from value of individual share futures and low exercise price options</td>
<td>Up to 0.5 (pre 45-day rule) 0.00 (post 45-day rule)</td>
</tr>
<tr>
<td>Bellamy &amp; Gray (2004)</td>
<td>Dividend drop-off (adjusted), (1995 to 2002)</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.81 (2001 to 04)</td>
</tr>
<tr>
<td>Feuerherdt, Gray &amp; Hall (2010)</td>
<td>Dividend drop-off, hybrid securities</td>
<td>0.00</td>
</tr>
</tbody>
</table>

\(^a\) Assuming a distribution rate of 100%.

\(^b\) One of the key conclusions of the paper is that the market value of the dividend exceeds its face value. The value of imputation credits is not estimated.

**Sources:**


In our recent WACC decision for the Sydney Desalination Plant, we lowered the upper bound of the gamma range to 0 and adopted a range of 0.5 to 0 with a midpoint of 0.25. We did this after careful consideration of SFG’s 2011 dividend drop-off study⁵ and the recent ACT decision on gamma.⁶ In particular, we recognised the fact that the SFG (2011) dividend drop-off study used by the ACT in coming to its decision contributes substantial new evidence to the debate on the most likely value of gamma. Any change in the gamma value will have an effect on prices and therefore this paper gives stakeholders the opportunity to comment on our assessment.

### 2.3 Other regulators’ gamma decisions

Table 2.2 summarises gamma values used by the other Australian regulators prior to the ACT’s recent decision on gamma in the review of the Australian Energy Regulator’s (AER) 2010 distribution determinations⁷. Compared to the gamma used by other Australian regulators, IPART’s gamma range of 0.5 to 0.3 with a midpoint of 0.4 is lower than all the other Australian regulators’ gamma values prior to the ACT’s decision.

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⁶ Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 5) [2011], ACompT 9.

⁷ Ibid.
### Table 2.2 Australian regulators’ gamma decisions (pre-ACT decision)

<table>
<thead>
<tr>
<th>Regulatory decision</th>
<th>Industry</th>
<th>Gamma value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australian Energy Regulator (AER)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victorian electricity distribution network 2011/15</td>
<td>Electricity distribution</td>
<td>0.5</td>
</tr>
<tr>
<td>Electricity transmission 2009</td>
<td>Electricity transmission</td>
<td>0.65</td>
</tr>
<tr>
<td><strong>Queensland Competition Authority (QCA)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEQ interim price monitoring 2010/11</td>
<td>Metropolitan water</td>
<td>0.5</td>
</tr>
<tr>
<td>Gladstone Area Water Board 2010</td>
<td>Metropolitan water</td>
<td>0.5</td>
</tr>
<tr>
<td>Dalrymple Bay Coal Terminal access undertaking 2010</td>
<td>Ports</td>
<td>0.5</td>
</tr>
<tr>
<td><strong>Essential Services Commission (ESC)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Victorian Ports 2009</td>
<td>Ports</td>
<td>0.5</td>
</tr>
<tr>
<td>Metropolitan Melbourne Water 2009</td>
<td>Metropolitan water</td>
<td>0.5</td>
</tr>
</tbody>
</table>

In addition, similar to the Australian taxation system, the New Zealand tax regime permits the use of imputation tax credits attached to dividend payments to offset investors’ tax obligations. The New Zealand regulator, the Commerce Commission, recognises the presence of imputation credits and uses the simplified Brennan-Lally CAPM to estimate cost of capital. The simplified Brennan-Lally CAPM assumes that companies attach maximum imputation credits to their dividends, and shareholders can fully utilise their credits.\(^8\) Therefore under this model, gamma is assumed to be 1.

### 2.4 Assessment criteria

The purpose of this paper is to take stock of the current evidence available on the most likely gamma value. We will assess the impact of recent research, the evidence for the recent ACT decision, and changes in regulatory and market practice on our own gamma estimate. Our assessment criteria are:

- stability of WACC and prices over time
- consistency with the approach taken by other regulators
- consistency with academic studies
- consistency with commercial practice.

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3 Distribution ratio

The general view of the commercial practitioners and academic studies suggests that most firms do not, in practice, distribute 100% of their free cash flows and imputation credits each period. We consider that an estimate of the distribution ratio of 0.7 is appropriate based on the currently available empirical evidence. A distribution ratio of 0.7 means that a typical Australian company distributes about 70% of the tax credits generated.

The actual market average distribution ratio based on data from the Australian Taxation Office (ATO) is 0.7.9 The most recent and comprehensive estimate of the market distribution ratio is 0.71, as provided by Hathaway and Officer (2004).10

Both NERA Economic Consulting11 and SFG12 suggest that the distribution ratio should be 0.7 based on the observed distribution ratios of Australian firms.

Regulators and academics generally agree that the value of the distribution ratio is close to 0.7. There is substantial disagreement on the other component of gamma, theta or the utilisation rate.

4 Estimation of theta in academic studies

4.1 Theta estimation methodologies

There are currently 3 main methods for assessing the value of theta: dividend drop-off, tax statistics and share futures. In this section we will assess the 3 methodologies in detail.

4.1.1 Dividend drop-off methodology

Dividend drop-off studies of theta involve examining share price changes on ex-dividend days. The amount by which share prices change (on average) is assumed to reflect the value of the dividend and imputation credit that has separated from the shares. An estimate of the value of the cash dividend is subtracted from the estimate of the combined value of the dividend plus imputation credit to leave an estimate of the value of the imputation credit.

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Dividend drop-off studies are based on the behaviour of equity prices around ex-dividend days. NERA (2008) noted that:

If a representative investor who trades around ex-dividend days resembles a representative investor who buys and holds equity, then the fall in stock price on the day a stock goes ex-dividend will match the value of the dividend if the tax disadvantage associated with the dividend is matched by a tax benefit associated with the franking credit attached to the dividend.\textsuperscript{13}

Different shareholders will place a different value on the imputation credits that are distributed to them. Resident shareholders can use imputation credits to reduce their personal tax obligations, whereas non-resident shareholders obtain no benefit from imputation credits. Theta represents the extent to which trading among all market participants results in some value in relation to imputation credits being impounded into the share price.\textsuperscript{14}

There are a number of variations of the dividend drop-off studies, for example, Walker and Partington (1999), Hathaway and Officer (2004) and Beggs and Skeels (2006). The most recent dividend drop-off study was conducted by SFG in March 2011.

**Advantage of dividend drop-off methodology**

- The key advantage of dividend drop-off studies is that they measure the observed market value of dividend and imputation credits. According to SFG, dividend drop-off studies are preferred to the tax statistics studies which are based on a conceptual model.

**Disadvantages of dividend drop-off methodology**

- Dividend drop-off studies have substantial measurement and estimation issues and involve analysis of trades in a restricted window.
- Results depend considerably on the particular specification of the regression equation and technique used to estimate the regression.
- Even given identical estimates of the value of fully franked dividends, estimates of theta may vary substantially depending on how the package of dividends and imputation credits is split up into its component values.\textsuperscript{15}

\textsuperscript{14} Since the 45-day trading rule came into effect.
\textsuperscript{15} M McKenzie & G Partington, *Report to AER – Evidence and submissions on gamma*, March 2010.
4.1.2 Tax statistics methodology

Tax statistics studies estimate the utilisation of imputation credits, which is a measure of the imputation credits redeemed by shareholders. Theta is estimated from a weighted average of utilisation across investors according to the fraction of total imputation credits in the market that they receive.

Tax statistics methodology was used by Hathaway and Officer (2004) and Handley and Maheswaran (2008) to estimate the value of imputation credits. Handley and Maheswaran (2008) is the most recent tax statistics study and the basis for the AER to derive a value of imputation credit of 0.65.

Handley and Maheswaran (2008) measured the efficacy of the Australian imputation tax system and examined the extent to which imputation credits have reduced the personal tax liabilities of equity investors in Australian firms. Their study is based on the Australian Taxation Office (ATO) statistics from 1988 to 2004. Their paper found that, on average, 67% of distributed imputation credits were used to reduce personal taxes from 1990 to 2000, and 81% from 2001 to 2004.16

The implied value of dividend imputation credits from this study is between 0.67 and 0.81.

Advantages of tax statistics methodology

▼ Based on actual tax data.

▼ Can be used to cross-check results obtained using other methodologies.

Disadvantages of tax statistics methodology

▼ Taxation studies present results that apply across a broad sweep of investors, but they are subject to measurement problems (this has proved to be less of an issue since the introduction of the simplified tax system). Furthermore, the link between taxation statistics and the market value of imputation credits remains indirect.

▼ Handley and Maheswaran (2008) acknowledged that their study was incomplete. Due to a lack of data, their estimates did not include superannuation funds operated by life assurance companies (to whom imputation credits are valuable) and tax-exempt entities.17

▼ SFG noted that tax statistics cannot be used to produce an estimate of theta. They can only be used to produce an upper bound that can be used as a cross-check of the reasonableness of an estimate produced by some other means.18

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17 Ibid, p 88.
18 SFG, Regulatory estimates of gamma in light of recent decisions of the Australian Competition Tribunal, Report prepared for DBP, 20 July 2011, p 3.
4.1.3 Share futures methodology

Share futures studies are different from dividend drop-off studies, which examines the change in share prices after the share goes ex-dividend.

Cannavan, Finn and Gray (2004) estimated the value of imputation credits in Australia by inferring the value of cash dividends and tax credits from the relative prices of share futures and the individual shares on which those futures are written. The study inferred the value of dividend imputation credits from 2 types of derivative securities: individual share futures (ISFs) and low exercise price options (LEPOs).

Cannavan, Finn and Gray found that:

- prior to the 45-day rule\(^{19}\), imputation credits were valued at up to 50% of face value for high-yielding firms
- after the 45-day rule, imputation credits were effectively worthless to the marginal investors of ISFs and LEPOs\(^{20}\)

The implied value of dividend imputation credits from this study is between 0 and 0.5. The relevant estimate is 0 as this is the estimate after the introduction of the 45-day rule.

Advantages of share futures methodology

- Depth of data — the simultaneous prices technique uses a large number of observations\(^{21}\).
- Volatility — trading volumes increase substantially around ex-dividend dates. But, the additional trading may be driven by short-term investors seeking to capture the dividend and imputation credit, affecting the resulting estimates. Using share futures provides a better estimate of the value of dividends and imputation credits to long-term providers of equity capital.

Disadvantages of share futures methodology

- The main limitation of the share futures study is that the data used are based on the trades in securities that only differ in the claim to franked dividends. There are not many situations where this occurs and the results are particular to the company and shareholder group.

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\(^{19}\) The 45-day rule requires resident taxpayers to hold shares for at least 45 days to be eligible to receive imputation benefits from dividends paid on shares. The rule aims to eliminate imputation credit trading where imputation benefits are received by someone other than the true economic owner of the underlying shares.


4.1.4 Assessment of methodologies

We are of the view that the dividend drop-off methodology is the best methodology to estimate the value of \( \theta \). Its most important advantage is that it measures the observed market value of dividends and imputation credits. While there are disadvantages associated with this methodology, we consider that, in this case, the advantages of the dividend drop-off methodology outweigh its disadvantages.

Dividend drop-off methodology is preferred to the tax statistics methodology, because dividend drop-off methodology measures the observed market value of dividend and imputation credits, whereas the tax statistics methodology is based on a conceptual model.

Officer (2011) noted that:

All methods have advantages and disadvantages but on balance the [dividend] drop-off studies are likely to provide a better estimate of \([\theta] \) with the tax statistics studies validating the results rather than acting as the primary source of the estimate…\(^{22}\)

Dividend drop-off methodology is also preferred to the share futures methodology. Academic studies using the latter to estimate the value of imputation credits have data limitation problems, as discussed in the previous section.

4.2 Dividend drop-off study – Strategic Finance Group (SFG 2011)

SFG undertook the latest dividend drop-off study using market data on dividend-paying events from 2000 to 2010 and examining the average ex-dividend price change associated with the dividend and imputation credits paid.\(^{23}\)

Data source and sample

The SFG’s dividend drop-off study (2011) uses data from DatAnalysis from 1 July 2000 to 30 September 2010. Data was also sourced from FinAnalysis, Datastream, SIRCA, and the ASX website. Various adjustments were made to the data to form a final dataset for analysis.


\(^{23}\) SFG, Dividend drop-off estimate of \( \theta \) – Final report, Re: Application by ENERGEX Limited (No 2) [2010] ACompT 7, March 2011.
The initial data comprised over 11,292 dividend observations covering the period 1 July 2000 to 30 September 2010. The final data set comprised 3107 dividend events with the removal of the following data:

- missing ex-date, currency, exchange rate or where franking was greater than 100% or dividends less or equal to 0
- share price or market capitalisation data not available
- market capitalisation was less than 0.03% of All Ordinaries Index
- stapled securities, exchange-traded funds or Chess Depository Interests
- capitalisation change within 5 days of ex-dividend date.

Modelling techniques

SFG (2011) presents 4 modelling results under:

- 2 alternate models of regression equations — the drop-off equation and the returns equation
- 2 alternate weighting schemes applied to those regressions — equal-weighting and weighting by the inverse of stock return variance
- 2 alternate regression techniques — ordinary least squares (OLS)/generalised least squares (GLS) and robust regression.

The 4 models are different econometric specifications of 1 model. SFG's Model 1 uses OLS, while Models 2 to 4 model theta using GLS, with various scaling variables used to minimise heteroscedasticity. Each model was also estimated using various robust regressions.

SFG has used White's correction for heteroscedasticity, and this assures that the confidence intervals are not dependent on an erroneous assumption. It has also used standard errors based on firm clustering, which increases the reliability of the calculated standard errors. In addition, the GLS model in 4 is further modified by weighting or scaling the variables by dividend yield and by the inverse of the standard deviation of the stock return to minimise heteroscedasticity.

Modelling results

Based on the dividend drop-off study they conducted, SFG conclude that the appropriate value of theta is 0.35, paired with a value of cash dividend of between 0.85 and 0.90. The model that performs most consistently and gives greatest confidence in the estimate of theta of 0.35 is Model 4.
SFG assigns more weight to the results of estimates of Model 4 and to the results of the robust regression estimation. This is because those results are the most stable and consistent across the range of sensitivity analysis and robustness checks that they have performed.

Compared with the earlier traditional dividend drop-off studies the SFG 2011 study:

- uses the most recent data
- results in the lowest value of imputation credits in dividend drop-off studies (Table 4.1).

### Table 4.1 Values for cash dividends and imputation credits estimated by traditional dividend drop-off studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Time period analysed</th>
<th>Estimated value of $1 dividends</th>
<th>Estimated value of $1 of imp. credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown and Walter (1986)</td>
<td>1973 to 1985</td>
<td>0.77</td>
<td>NA</td>
</tr>
<tr>
<td>Brown and Clarke (1993)</td>
<td>1989 to 1991</td>
<td>0.89</td>
<td>0.80</td>
</tr>
<tr>
<td>Bruckner, Dews and White (1994)</td>
<td>1990 to 1993</td>
<td>0.62</td>
<td>0.69</td>
</tr>
<tr>
<td>Hathaway and Officer (2004)</td>
<td>1986 to 2004</td>
<td>0.80</td>
<td>0.49</td>
</tr>
<tr>
<td>Bellamy and Gray (2004)</td>
<td>1995 to 2002</td>
<td>0.83</td>
<td>0.36</td>
</tr>
<tr>
<td>Beggs and Skeels (2006)</td>
<td>2000 to 2004</td>
<td>0.80</td>
<td>0.57</td>
</tr>
<tr>
<td>SFG (2011)</td>
<td>2000 to 2010</td>
<td>0.85-0.90</td>
<td>0.35</td>
</tr>
</tbody>
</table>

**Estimation issues of heteroscedasticity and multicollinearity**

Similar to other drop-off studies, the SFG modelling is subject to heteroscedasticity and multicollinearity that generally occurs in OLS regression.

Heteroscedasticity occurs when the variance of the residuals (errors) changes through the (time) series. It does not bias the estimates but it does lead to unreliable values for the standard errors of the estimates. SFG (2011) has used weighted least squares (WLS) to address the heteroscedasticity in the data, and MM regression so that the results are robust to distribution of the errors. An expert review found that the SFG study had properly addressed the estimation difficulties associated with heteroscedasticity.24

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Multicollinearity also occurs in OLS when the independent variables are related (exhibit collinearity, they are correlated). In the case of the dividend drop-off study, the level of imputation credits is related to the amount of franked dividend so that, when both variables are used to explain price behaviour of a stock pre and ex-dividend, there will be multicollinearity. The result is that the estimate of the parameters attached to the independent variables is unreliable. Greater effect may be attributed to one variable and less to another than should occur. Expert review of the SFG’s modelling for multicollinearity indicates that multicollinearity is not a significant issue.

**Assessment of SFG (2011)**

Overall, the SFG (2011) study is considered “state-of-the-art” compared with the previous dividend drop-off studies in 2 ways.

Firstly, recent reviews by its peers and the AER indicate that the study has applied appropriate econometric methods (such as robust regression) in its analysis. The study also uses WLS to overcome the expected heteroscedasticity in the data. Together with other statistical techniques that SFG applies (such as White's heteroscedastic consistent standard errors and standard errors based on firm clustering) the reliability of the reported results increases. Secondly, the SFG study has been conducted using a comprehensive database that enables a thorough sensitivity analysis of the influence of the inclusion/exclusion of particular observations from the sample.

Although the AER raised major compliance issues with the terms of reference of the study and SFG’s treatment of the data, these were dismissed by the ACT as “unnecessarily pejorative” and as raising “no important or significant questions of principle”. The ACT concluded that any procedures used by SFG to select and filter data were appropriate and did not bias the modelling results.

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25 The AER accepts that it is appropriate to give weight to the results of the GLS (or WLS) regressions under SFG’s Model 4: see AER, Report to the Australian Competition Tribunal, the value of imputation credits, April 2011, p 32.


27 Application by ENERGEX Limited (Gamma) (No 5) [2011] ACompT 9, 12 May 2011, paras 16-19.
5 Gamma value in commercial practice

In past gamma decisions we referred to WACC calculations which were done as part
of independent expert reports. These commercial valuations based their WACC
estimate on a classical tax system and hence used a gamma value of 0.

In 2011, SFG noted that:

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

The great majority of CFOs of major Australian companies (who between them account for
more than 85% of the equity capital of listed Australian firms) make no adjustment at all to
either cash flows or discount rates to reflect any assumed value of franking credits
(Truong, Partington and Peat, 2008).28

We have recently held informal talks with market practitioners. They indicated that,
in valuations where an imputation tax system is being used, they tend to use a
gamma of 0.25 since the ACT’s 2011 gamma decision.

6 Regulatory practice

6.1 Recent changes in regulatory practice

In May 2010, the Australian Energy Regulator (AER) made a final decision on the
WACC for electricity distribution networks in Queensland. In this decision, the AER
used a gamma of 0.65.29 This estimate was based on a simple average of estimates
from a tax statistics study and a dividend drop-off study. However, ENERGEX,
Ergon Energy and ETSA Utilities did not accept the AER’s decision and applied to
the ACT to review the decision regarding the value of imputation credits.

In October 2010, the ACT gave directions to the AER to engage SFG to undertake a
dividend drop-off study to assist them in determining the correct gamma value.

In May 2011, the ACT determined that the value of gamma is 0.25.30

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28 SFG, Regulatory estimates of gamma in light of recent decisions of the Australian Competition Tribunal,
30 Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 5) [2011]
ACompT 9.
6.2 The ACT’s gamma decisions

The ACT’s 2010\(^{31}\) and 2011\(^{32}\) decisions on gamma ruled that the AER had made an error in determining the gamma for ENERGEX, Ergon and ETSA.\(^{33}\) It adopted a gamma of 0.25.

The ACT addressed the issue of dividend drop-off analysis and held that the AER equally weighted the different gamma studies.\(^{34}\) The ACT decision outlined the following alleged errors:

82. The AER derived its estimate of theta (0.65) by:

first, simply averaging two estimate from the Handley and Maheswaran (2008) tax statistics study (one, of 0.67, derived from a study covering the period from 1988-2000 and the other, of 0.81, from a study covering 2001-2004) to arrive at a figure of 0.74;

secondly, averaging the average of those tax statistics studies (0.74) and the result of the Beggs and Skeels (2006) post-July 2000 dividend drop-off study (0.57) to arrive at 0.655;

thirdly, rounding the average of the tax statistics and dividend drop-off studies (0.655) to arrive at 0.65.

83. The applicants submit that the AER was in error in a number of ways. The most important can be summarised as follows:

the AER averaged ‘apples and oranges’; that is, the AER was in error to average an upper bound for theta derived from a tax statistics study with a point estimate provided by a dividend drop-off study;

the AER failed to recognise that the estimate from Handley and Maheswaran (2008) involved an assumption about the utilisation rate, rather than an empirical estimate of it; and

the AER wrongly placed no reliance on an estimate of 0.23 from the SFG 2010 dividend drop-off study. (The SFG 2010 study was the result of a number of iterations as reservations by the AER were serially addressed. Those iterations are hereafter referred to as ‘the SFG study’ because the basic methodology and data set were progressively amended rather than fundamentally changed.\(^{35}\))

The ACT directed the AER to obtain from SFG a “state-of-the-art” dividend drop-off analysis using a methodology that is agreed with the AER. The result of that study is a theta estimate of 0.35, which was accepted by the ACT.

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\(^{31}\) Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 2) [2010], ACompT 7.

\(^{32}\) Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 5) [2011] ACompT 9.

\(^{33}\) ENERGEX, Ergon and ETSA operate electricity distribution businesses that are regulated by the AER.

\(^{34}\) Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 2) [2010], ACompT 7, paras 93–96 and 145–47.

\(^{35}\) ibid, paras 82 and 83.
Also, the ACT addressed the use of tax statistics studies, holding that the results of such a study would be relevant in cross-checking the results derived from the dividend drop-off methodology:

…its relevance could only be related to the fact that it was an upper bound. No estimate that exceeded a genuine upper bound could be correct. Thus the appropriate way to use the tax statistics figure was as a check.36

The Tribunal further held that the AER had made “an error of logic” in using the tax statistics figure as an estimate of theta rather than as a sanity check:

…the tax statistics figure did no more than confirm that the [dividend drop-off] figure was not to be ruled out as being too high, ie, higher than the correct figure could possibly be.37

The ACT’s final decision was that:

▼ the best available estimate of the distribution rate is 70% and there is no evidence to support a higher value38

▼ the best available dividend drop-off estimate of theta is 0.3539

▼ these 2 parameters produce an estimate of gamma of 0.25.

This decision was based on SFG’s dividend drop-off study:

The [Australian Competition] Tribunal is satisfied that SFG’s March 2011 report is the best dividend drop-off study currently available for the purpose of estimating gamma in terms of the [National Electricity] Rules40

And:

Taking the values of the distribution ratio and of theta that the tribunal has concluded should be used, viz 0.7 and 0.35, respectively, the [Australian Competition] Tribunal determines that the value of gamma is 0.25.41

### 6.3 Australian regulators’ gamma decisions (post-ACT decision)

After the ACT made the decision on gamma of 0.25, 2 Australian regulators changed their estimates of gamma. As shown in Table 6.1, both the AER and Economic Regulation Authority of Western Australia (ERAWA) adopted the ACT’s gamma value.

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36 Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 2) [2010], ACompT 7, para 91.
37 Ibid, para 92.
38 Australian Competition Tribunal, Application by ENERGEX Limited (Gamma) (No 5) [2011] ACompT 9, para 8.
39 Ibid, para 29.
40 Ibid, para 29.
41 Ibid, para 42.
### Table 6.1 Australian regulators’ gamma decisions (post-ACT decision)

<table>
<thead>
<tr>
<th>Regulatory decision</th>
<th>Industry</th>
<th>Gamma value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian Energy Regulator (AER)</td>
<td>Queensland distribution 2011/15</td>
<td>Electricity distribution</td>
</tr>
<tr>
<td>Economic Regulation Authority of Western Australia (ERAWA)</td>
<td>Dampier to Bunbury Natural Gas Pipeline access arrangement 2011</td>
<td>Gas transmission</td>
</tr>
</tbody>
</table>

### 7 Impact on building block revenue

We changed our approach to taxation by changing from a pre-tax WACC model to a post-tax WACC approach in December 2011. The impact of gamma on building block revenue under both WACC approaches is considered and explained in Sections 6.1 and 6.2.

#### 7.1 The pre-tax WACC model

Under a pre-tax WACC, tax and gamma are included in the WACC calculation. The relevant formula is:

$$WACC_{pre-tax} = \left(1 + \left[\frac{R_e}{1-t(1-\gamma)} \left(\frac{E}{D+E} + R_d \left(\frac{D}{D+E}\right)\right)\right]\right)^{-1}$$

Where $R_e$ is the return on equity, $R_d$ is the return on debt, $\frac{E}{D+E}$ is the proportion of equity, $\frac{D}{D+E}$ is the proportion of debt, $t$ is the corporate tax rate, and $(1+\Pi)$ is the inflation adjustment.

Under the pre-tax WACC framework, gamma is a WACC parameter. Gamma is inversely related to WACC, return on regulatory asset base and regulatory revenue.
Figure 7.1 Impact of change of gamma on notional revenue — Sydney Water Review (2012/13 to 2015/16) ($2011/12)

Note: The notional revenue is the total revenue for 4 years (2012/13 to 2015/16). The notional revenues calculated based on different gamma values are based on Sydney Water Corporation’s submission.

Figure 7.1 shows the inverse relationship between gamma and notional revenue. In the review of prices for water, sewerage and stormwater services by Sydney Water Corporation from 2012/13 to 2015/16, a decrease in gamma from 0.4 to 0.25 would contribute to an increase in notional revenue of 1.3% ($119m = $9,454m - $9,335m).

7.2 The post-tax WACC model

Under a post-tax modelling framework, imputation tax credits are modelled as part of the tax liabilities.

A post-tax real WACC can be estimated using the following formula:

\[
WACC_{\text{post-tax}} = \frac{1 + \left[R_e \left(\frac{E}{D+E}\right) + R_d \left(\frac{D}{D+E}\right)\right]}{(1 + \Pi)} - 1
\]

where \(R_e\) is the return on equity, \(R_d\) is the return on debt, \(\frac{E}{D+E}\) is the proportion of equity, \(\frac{D}{D+E}\) is the proportion of debt, and \((1+\Pi)\) is the inflation adjustment.

Tax liabilities can be estimated using the following formula:

\[
T = \frac{1}{(1 + \Pi)} \left[R_e (1 + \Pi_e) - OPEX_e (1 + \Pi_e) - TD - I\right] \left[\frac{t_c(1 - \gamma)}{1 - t_c(1 - \gamma)}\right]
\]
Where $T$ is the real tax liability, $(1 + \Pi)$ is the cumulative inflation adjustment, $R$ is real allowable regulated revenue exclusive of tax, OPEX is real operating costs, $TD$ is nominal tax depreciation, $I$ is nominal interest payments, $t$ is the corporate tax rate and $\gamma$ is the value of imputation credits.

The formula above indicates an inverse relationship between gamma and the tax liability, that is, a decrease in gamma will contribute to an increase in tax liability and vice versa.

$$\left[ \frac{t(1 - \gamma)}{1 - t(1 - \gamma)} \right]$$ affects the relationship between gamma and the tax liability.

An increase in $\gamma$ will increase $\left[ \frac{1}{t(1 - \gamma)} - 1 \right]$ and therefore lower the tax liability.

Under the post-tax WACC framework, gamma is not a parameter of WACC; therefore, change of gamma does not affect the regulatory depreciation and return on regulatory asset base.

The overall impact of a decrease in gamma will increase the total notional revenue, only due to the increase of tax liability.

**Figure 7.2 Impact of change of gamma on notional revenue — Sydney Water Review (2012/13 to 2015/16) ($2011/12$)**

Note: The notional revenue is the total revenue for 4 years (2012/13 to 2015/16). The notional revenues calculated based on different gamma values are based on Sydney Water Corporation’s submission.
Figure 7.2 shows the inverse relationship between gamma and notional revenue. As illustrated, in the review of prices for water, sewerage and stormwater services by Sydney Water Corporation from 2012/13 to 2015/16, a decrease in gamma from 0.4 to 0.25 would contribute to an increase in notional revenue of 0.4% ($34m = $9,106m - $9,072m).

We recently changed our WACC approach from a pre-tax to a post-tax model. This effectively moves the gamma parameter from the WACC formula into the tax liability calculation. In a separate paper on the taxation liabilities\(^ {42} \), we note that moving to a post-tax model will require us to use a point estimate of gamma rather than a range.

### 8 Assessment of appropriate value of gamma

The Tribunal’s preliminary view is that there is sufficient evidence indicating that 0.25 provides a better estimate of gamma than our current assumption of 0.4. The SFG (2011) dividend drop-off study provides well-grounded evidence that the appropriate estimate of theta from the dividend drop-off analysis is 0.35. Empirical evidence\(^ {43} \) suggests that the best available estimate of the distribution rate is 0.7. These 2 parameters produce an estimate of gamma of 0.25.

Our assessment is based on the criteria set out in Chapter 2.

- Stability of WACC and prices over time.

We currently use a gamma range of 0.5 to 0.3, with a mid-point of 0.4. Changing the gamma value from 0.4 to 0.25 will contribute to a change in the WACC between regulatory periods. The change in gamma also has an impact on notional revenue, but the impact is small (0.4%), indicated by Figure 7.2 under the post-tax WACC framework.

- Consistency with the approach taken by other regulators.

The AER has adopted a gamma value of 0.25 based on the ACT’s 2010/11 decisions. The ERAWA also changed its gamma to 0.25 for the 2011 Dampier to Bunbury Natural Gas Pipeline access arrangement.

\(^ {42} \) IPART, The incorporation of company tax in pricing determinations – Final Decision, December 2011.

Consistency with academic studies.

As noted in Chapter 4, we consider that the dividend drop-off methodology used in the SFG study is currently the best approach. The SFG (2011) study appears to be a “state-of-the-art” dividend drop-off study, which has been well-tested through the ACT review process. The results of the SFG (2011) study are not inconsistent with past studies but add weight to the evidence for a lower gamma than we previously used.

Consistency with commercial practice.

Most commercial valuations use a classical tax system with a gamma value of 0. For those that use an imputation tax system, we confirmed that, after the ACT decision, some practitioners use a gamma value to 0.25.44

Having regard to the available evidence, our preliminary view is to use a gamma value of 0.25 in our future price determinations.

9 Questions to stakeholders

IPART seeks comments on the following

1 Are there other assessment criteria on gamma apart from those used by the Tribunal?
2 Is there any additional evidence on the appropriate distribution ratio and theta?
3 Should dividend drop-off studies, tax statistics studies and share futures studies be considered jointly in determining gamma, or is there a preferred single study?
4 What are the other advantages and disadvantages associated with the 3 methodologies: dividend drop-off, tax statistics and share futures?
5 Do you have any relevant issues to raise which are not already mentioned in this paper?

44 Discussions with commercial practitioners.