The Relationship Between Franking Credits and the Market Risk Premium

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ABSTRACT

In a dividend imputation tax system, equity investors have three potential sources of return: dividends, capital gains, and franking (tax) credits. However, the standard procedures for estimating the market risk premium (MRP) for use in the CAPM, ignore the value of franking credits. Officer (1994) notes that if franking credits do affect the corporate cost of capital, their value must be added to the standard estimates of MRP. In this paper, we explicitly derive the relationship between the value of franking credits (gamma) and the MRP. We show that the standard parameter estimates that have been adopted in practice (especially by Australian regulators) violate this deterministic mathematical relationship. We also show how information on dividend yields and effective tax rates bounds the values that can be reasonably used for gamma and the MRP. We make recommendations for how estimates of the MRP should be adjusted to reflect the value of franking credits in an internally consistent manner.

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1

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ABSTRACT

In a dividend imputation tax system, equity investors have three potential sources of return: dividends, capital gains, and franking (tax) credits. However, the standard procedures for estimating the market risk premium (MRP) for use in the CAPM, ignore the value of franking credits. Officer (1994) notes that if franking credits do affect the corporate cost of capital, their value must be added to the standard estimates of MRP. In this paper, we explicitly derive the relationship between the value of franking credits (gamma) and the MRP. We show that the standard parameter estimates that have been adopted in practice (especially by Australian regulators) violate this deterministic mathematical relationship. We also show how information on dividend yields and effective tax rates bounds the values that can be reasonably used for gamma and the MRP. We make recommendations for how estimates of the MRP should be adjusted to reflect the value of franking credits in an internally consistent manner.

1. Introduction

It is standard practice to measure equity returns as dividends plus capital gains. Indeed, all known data sources measure equity returns in this way. However, in a dividend imputation system, there is potentially a third component of returns—franking credits. To the extent that franking credits are valued by the market, this value must be added to the standard return measure. Officer (1994) makes this point in the paper that develops the cost of capital framework under a dividend imputation tax system.

If franking credits form part of the equity return for individual firms, they must also form a part of the market return. Therefore, if franking credits have value, this value must be reflected in estimates of the MRP. However, standard estimates of the MRP ignore franking credits entirely. Hence, if the MRP is estimated using returns that are measured in the standard way (reflecting dividends and capital gains only), the assumed value of franking credits must be added to compute a grossed-up MRP, which can then be used in the CAPM to compute the cost of equity capital.

In this paper, we review the mathematically deterministic relationship between the assumed value of franking credits and the estimate of MRP. This is the framework developed by Officer (1994). Our focus in this paper is not on how to best estimate the value of franking credits or the market risk premium, but on the relationship between them. If franking credits are assumed to have value, the MRP must reflect this. It is inconsistent to assume that franking credits are valuable such that they reduce corporate cost of equity, but then ignore them when estimating the market risk premium.

The main contribution of the paper is that we derive an explicit relationship between the value of franking credits (gamma), the MRP, and the assumed tax rate. If tax rates and the value of franking credits are assumed to be high, the MRP must also be high. This is because higher tax payments generate more tax credits, which are more valuable if gamma (γ) is assumed to be high. This value of franking credits must then be added to standard estimates of MRP.

However, the assumptions about tax rates and the value of franking credits must also be consistent with observed dividend yields. This is because franking credits can only be distributed with dividend payments. It would be inconsistent to assume that large amounts of franking credits are created and that these credits are valuable to investors if observed dividend yields were wholly insufficient to distribute these credits to investors. In this paper, we examine the mathematical relationship between these various parameters. We then examine how standard assumptions about parameter values would have to be changed in order to preserve internal consistency.

In the next section, we revisit the Officer (1994) framework and provide an intuitive economic explanation of how franking credits might affect the cost of capital of Australian firms. Section Three derives the deterministic mathematical relationship between gamma and MRP. In

Section Four, we draw several examples from Australian regulatory determinations and demonstrate that the parameter values typically assumed are internally inconsistent. We also explore several methods for restoring internal consistency. Section Five examines attempts that have been made to adjust MRP estimates for the value of franking credits and Section Six concludes.

2.   Interpretation of the Officer (1994) Framework

Officer (1994) develops a framework for consistently defining the cost of capital and cash flows in a dividend imputation tax system. This framework, and particularly the definitions of weighted-average cost of capital (WACC), have been widely adopted in Australian practice.

Officer (1994) presents definitions of WACC on a before and after corporate tax basis. In this section, we begin by examining his first definition of after corporate tax cash flows and WACC, for ease of exposition. Under this definition, the effect of franking credits is incorporated in the discount rate—the cost of equity capital. The same arguments apply regardless of which definition of WACC is used and whether franking credits are incorporated in the WACC or the cash flows. We subsequently examine the vanilla WACC specification, under which the effect of franking credits is incorporated in the cash flows. We demonstrate that the two approaches are entirely equivalent and lead to the same conclusions, based on the same intuition. Our points relate to the internal consistency of various parameter estimates. Using an estimate of γ in defining cash flows that is inconsistent with the estimate of MRP used to estimate WACC is just as problematic as if both are incorporated in the WACC estimate. Separating inconsistencies may make them harder to spot, but does not eliminate their effect. Moreover, Officer demonstrates that all of his WACC/cash flow definitions produce identical results so long as they are applied consistently.

Officer (1994) begins by defining after corporate tax cash flows as $X_o(1-T)$, consistent with the standard textbook treatment. Here X_o represents operating cash flows and T represents the relevant corporate tax rate. The definition of the after corporate tax discount rate that is consistent with this definition of cash flows is stated in his Equation (7) as:

$$r_i = r_E \frac{S}{V} \frac{1-T}{1-T(1-\gamma)} + r_D \frac{D}{V}(1-T) \qquad (1)$$

where:

r_i is the weighted-average cost of capital, reflecting the tax deductibility of interest and the value of franking credits,

r_E is the return on equity capital required by investors,

r_D is the return on debt capital required by investors,

$\dfrac{S}{V}$ is the proportion of equity finance,

$\dfrac{D}{V}$ is the proportion of debt finance,

T is the corporate tax rate, and

γ is the value of franking credits.

In this framework, r_D is the return that debtholders require (before personal tax) to compensate them for the risk involved in lending to the firm. Since these interest payments are tax deductible at the corporate level, the firm's after-tax cost of debt capital is $r_D(1-T)$. That is, if debtholders require a return of 7% and the corporate tax rate is 30%, the firm's after-tax cost of debt is 4.9%. Of the 7% required return, 4.9% is provided by the firm and 2.1% is effectively provided by government via the tax system.

The same applies to the cost of equity. Here, r_E is the return that equityholders require (before personal tax) to compensate them for the risk involved in owning shares in the firm. In the Australian regulatory framework, and in commercial practice, r_E is usually estimated using the Capital Asset Pricing Model (CAPM). This provides an estimate of the return that the equityholders require. As is the case for debt, there is a difference between the investors' required return and what the firm must pay if a government tax subsidy is relevant. In particular, equityholders require a total after corporate tax return of r_E. This return potentially has three components: dividends, capital gains, and franking credits. The firm is responsible for generating dividends and capital gains. Franking credits are paid by government via the tax system. Officer's WACC formula quantifies the proportion of r_E that must be generated by the firm, $\dfrac{1-T}{1-T(1-\gamma)}$,

and the proportion that is paid by government via the imputation tax system, $\dfrac{\gamma T}{1-T(1-\gamma)}$. Thus, the firm's after-tax cost of equity capital is $r_E \dfrac{1-T}{1-T(1-\gamma)}$. Indeed this is the key contribution of Officer (1994). He derives the proportion of the required return on equity that must be generated by the firm via dividends and capital gains.

Of course, this point is well recognized in the academic and practitioner literature. Copeland, Koller and Murrin (2000, p. 134), for example, note that the WACC is "the opportunity cost to all the capital providers weighted by their relative contribution to the company's total capital." They also note (p. 134-5) that, "the opportunity cost to a class of investors equals the rate of return the investors could expect to earn on other investments of equivalent risk. The cost to the company equals the investors' costs less any tax benefits received by the company (for example, the tax

shield provided by interest expense)." In a dividend imputation system, the government may also subsidize equity returns via the payment of franking tax credits.

In the detailed numerical example in his Appendix, Officer (1994, pp. 11 - 17), shows how the CAPM can be used to derive a required return on equity of 17.7% and that the firm's cost of equity is:

$$r_E \frac{1-T}{1-T(1-\gamma)} = 17.7\% \frac{1-0.39}{1-0.39(1-0.5)} = 13.4\% \tag{2}$$

using the parameter values assumed in the example. That is, the imputation tax system has reduced the firm's cost of equity capital by 4.3% in this case. The value of this reduction in the firm's cost of equity is capitalized into the stock price. In this case, the value of equity increases from $120 million (under a classical tax system) to $158.361 million (under an imputation system in which $\gamma = 0.5$). Officer demonstrates that the equityholders' required return does not change. What changes is the proportion of this return that must be generated by the firm. In a classical system, the firm has to generate all of this return. In an imputation system, the government funds some of this required return (in fact 4.3%) which reduces the firm's after tax cost of equity from 17.7% to 13.4%. That is, the CAPM tells us what return equityholders require (a return that is measured after company tax but before personal tax) and Officer (1994) derives the proportion of that return that must be generated by the firm, $\frac{1-T}{1-T(1-\gamma)}$.

Alternatively, Officer (1994) also shows how the value of franking credits can be incorporated in the firm's cash flows rather than the discount rate. In his Equation (12), Officer defines the vanilla WACC as:

$$r_{iii} = r_E \frac{S}{V} + r_D \frac{D}{V}. \tag{3}$$

This discount rate should be applied to cash flows defined as in his Equation (11):

$$(X_0 - X_D)(1 - T(1-\gamma)) + X_D, \tag{4}$$

where X_D represents interest payments to debtholders.

That is, under an imputation system, the cash flow to equity holders is:

$$(X_0 - X_D)(1 - T(1 - \gamma)).$$ (5)

Without imputation $(\gamma = 0)$, the cash flow to equity holders would be:

$$(X_0 - X_D)(1 - T).$$ (6)

Thus, the component of the cash flow to equity that is due to the value of franking credits is the difference between the two:

$$(X_0 - X_D)\gamma T.$$ (7)

Therefore, the proportion of the total cash flow to equity that is due to franking credits is:

$$\frac{(X_0 - X_D)\gamma T}{(X_0 - X_D)(1 - T(1 - \gamma))} = \frac{\gamma T}{1 - T(1 - \gamma)}.$$ (8)

This is the same proportion of the cost of equity that was due to franking credits, as derived above. That is, if we prefer to incorporate the value of franking credits in the discount rate, we can conclude that $\frac{\gamma T}{1 - T(1 - \gamma)}$ proportion of the cost of equity is paid by the government via franking credits. If we prefer to put the value of franking credits into the cash flows instead, we conclude that $\frac{\gamma T}{1 - T(1 - \gamma)}$ proportion of the total cash flow to equity is paid by the government via franking credits. In both cases, the balance, $\frac{1 - T}{1 - T(1 - \gamma)}$, must be generated by the firm itself.

3. The Relationship Between Gamma and MRP

3.1. The Cost of Equity Capital

The dominant commercial practice in Australia is to use the CAPM to estimate the return required by equityholders. This is the equilibrium return that they require on their equity investment after corporate tax but before personal tax. This return is defined as:

$$\hat{k}_e = r_f + (\hat{k}_m - r_f)\beta_e$$ (9)

where $\hat{k}_e$ and $\hat{k}_m$ represent the expected returns on equity and the Australian market portfolio respectively; r_f the risk-free rate; and β_e is the firm's equity beta.

Officer (1994) shows that the market return should include the value of franking credits such that the expected return on equity is the total return, inclusive of dividends, capital gains and franking credits. If market returns are defined in terms of dividends and capital gains only, Officer (1994, eq. 18) shows that the value of franking credits must be added back to obtain the total after corporate tax market return. The CAPM then yields the total required return on equity, part of which must be provided by the firm and part of which is provided by government via franking credits.

3.2. Return to Equityholders under Dividend Imputation

Under a dividend imputation system, the expected return to equityholders comprises a return from dividends and capital gains, plus the benefit of franking credits, which can be expressed as:

$$\hat{k}_e = \hat{k}_e \left[\frac{1-T}{1-T(1-\gamma)} \right] + \hat{k}_e \left[\frac{\gamma T}{1-T(1-\gamma)} \right] \tag{10}$$

where $\hat{k}_e$ is the total required return on equity, which may be estimated using the CAPM, so long as the MRP includes the value of franking credits; T is the corporate tax rate; and γ is the market value of franking credits as a proportion of franking credits created. This specifically recognizes that part of the return required by equityholders is provided by the firm via dividends and capital gains and part is provided by government via franking credits.

On the right hand side of the equation, the first term represents the return on equity from dividends and capital gains, while the second term represents the return on equity from the benefits of dividend imputation. Allocating the total return to equityholders into these two components we can say that:

$$\text{Proportion of return from dividends and capital gains} = \left[\frac{1-T}{1-T(1-\gamma)} \right]$$

$$\tag{11}$$

$$\text{Proportion of return from dividend imputation} = \left[\frac{\gamma T}{1-T(1-\gamma)} \right]$$

These proportions are based on Officer (1994) and are illustrated in terms of discount rates and cash flows in Section 2. Table 1 and Figure 1 present these proportions for alternative values for the corporate tax rate and the value of franking credits. For example, with a corporate tax rate of

8

30% and gamma set at 0.5, 82% of the total return required by (or cash flow available to) equityholders is comprised of dividends and capital gains, while 18% of the total return (or cash flow) consists of franking benefits.

Table 1: Proportion of returns to equityholders from dividends and capital gains versus franking credits under alternative values for the corporate tax rate and the value of franking credits (gamma)

Tax rate	Gamma				
	0.00	**0.25**	**0.50**	**0.75**	**1.00**
Proportion of returns attributable to dividends and capital gains (%)					
10%	100	97	95	92	90
20%	100	94	89	84	80
30%	100	90	**82**	76	70
40%	100	86	75	67	60
50%	100	80	67	57	50
Proportion of returns attributable to franking credits (%)					
10%	0	3	5	8	10
20%	0	6	11	16	20
30%	0	10	**18**	24	30
40%	0	14	25	33	40
50%	0	20	33	43	50

Figure 1: Proportion of return on equity from dividends and capital gains under alternative tax rates and the value of franking credits (gamma)
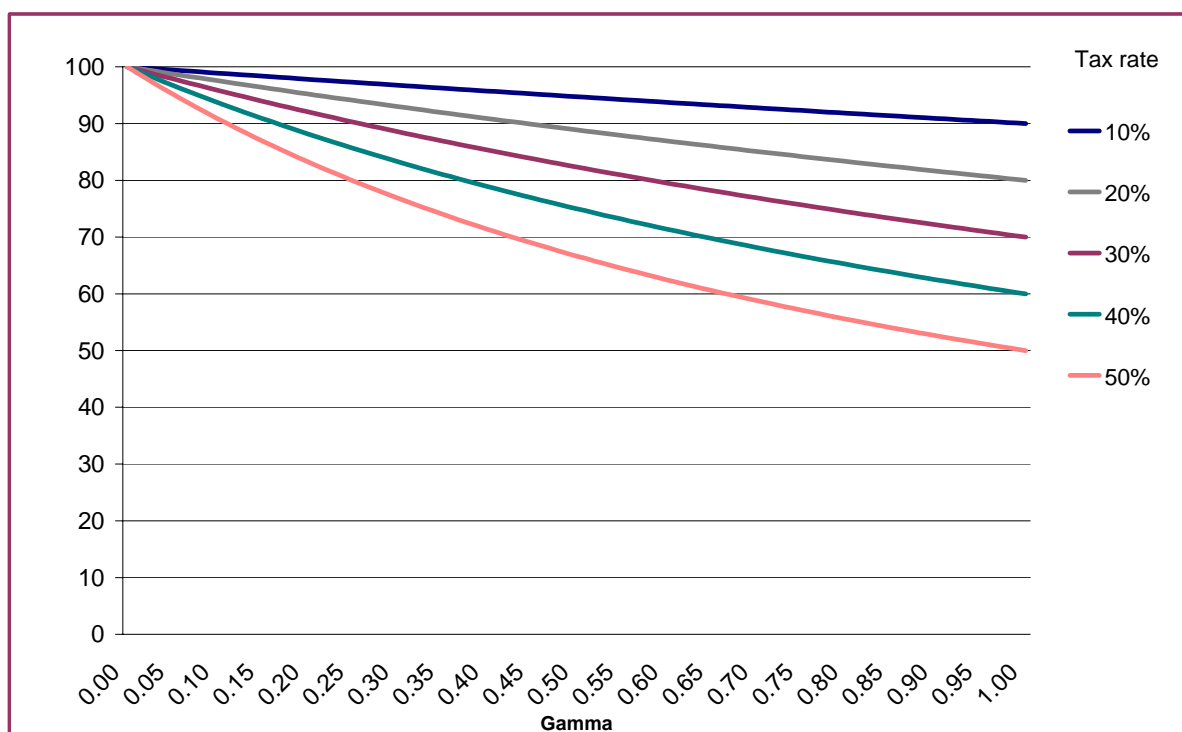
3.3. Franking Credits and the MRP

Recall that implementation of the CAPM in this setting requires a market risk premium $\left(\hat{k}_m - r_f\right)$ that includes the value of franking credits. This framework, combined with the discussion

in Sections 3.1 and 3.2, implies that we can derive an expression for the market risk premium. Combining the equations in Sections 3.1 and 3.2 we have:

$$r_f + \left(\hat{k}_m - r_f\right)\beta_e = \hat{k}_e\left[\frac{1-T}{1-T(1-\gamma)}\right] + \hat{k}_e\left[\frac{\gamma T}{1-T(1-\gamma)}\right].$$ (12)

For a firm with average systematic risk ($\beta_e = 1$, representative of the market portfolio), the cost of equity capital is:

$$r_f + \left(\hat{k}_m - r_f\right) = \hat{k}_e\left[\frac{1-T}{1-T(1-\gamma)}\right] + \hat{k}_e\left[\frac{\gamma T}{1-T(1-\gamma)}\right].$$ (13)

Consider the second term on the left-hand side of the equation, the market risk premium $\left(\hat{k}_m - r_f\right)$. This term represents the equityholders' compensation for bearing systematic risk, and includes the value of franking benefits. These franking benefits are quantified in the second term on the right-hand side of the equation, $\hat{k}_e\left[\frac{T\gamma}{1-T(1-\gamma)}\right]$. Hence, if we subtract the risk-free rate from both sides of the equation, we have:

$$\left(\hat{k}_m - r_f\right) = \left\{\hat{k}_e\left[\frac{1-T}{1-T(1-\gamma)}\right] - r_f\right\} + \hat{k}_e\left[\frac{\gamma T}{1-T(1-\gamma)}\right]$$ (14)

$$MRP = \begin{array}{c}\text{Risk premium from}\\ \text{dividends and capital gains}\end{array} + \begin{array}{c}\text{Risk premium from}\\ \text{franking credits}\end{array}$$

Recall that Officer (1994) has shown that dividends and capital gains make up a proportion, $\left[\frac{1-T}{1-T(1-\gamma)}\right]$, of the total return to equity, the balance due to the value of franking credits. Next, define MRP_{fc} to be the market risk premium including franking credits and MRP_{dc} to be the market risk premium from dividends and capital gains only. Now, the total return on the market portfolio, including franking credits is $MRP_{fc} + r_f$ and the return from dividends and capital gains only is $MRP_{dc} + r_f$.

Hence,

$$\begin{bmatrix} \text{Market return from} \\ \text{dividends and capital} \\ \text{gains.} \end{bmatrix} = \begin{bmatrix} \text{Market return from} \\ \text{dividends, capital gains} \\ \text{and franking credits.} \end{bmatrix} \begin{bmatrix} \dfrac{1-T}{1-T(1-\gamma)} \end{bmatrix}. \quad (15)$$

This implies that:

$$MRP_{dc} + r_f = \left[MRP_{fc} + r_f \right] \left[\frac{1-T}{1-T(1-\gamma)} \right], \quad (16)$$

in which case:

$$MRP_{fc} = \frac{r_f + MRP_{dc}}{(1-T)/[1-T(1-\gamma)]} - r_f. \quad (17)$$

Note that this formulation is entirely consistent with the analysis of Officer (1994, p. 9). In his Equation 17, Officer states that the market return including the value of franking credits is equal to the return as traditionally measured (dividends and capital gains only) plus the value of franking credits:

$$r_t' = r_t + \gamma \frac{C_t}{P_{t-1}}, \quad (18)$$

where r_t' is the all-inclusive market return, r_t is the traditionally measured return, γ is the value of franking credits, and $\dfrac{C_t}{P_{t-1}}$ is the franking credit yield. Officer (1994) defines C_t to be the amount of tax credits per share distributed at time t. However, this is a typographical error and C_t actually refers to credits *created* not *distributed*. It is well-known that γ is applied to franking credits created not distributed, and this is also consistent with the detailed calculations in Officer's appendix. Thus, $\dfrac{C_t}{P_{t-1}}$ must be interpreted as the amount of franking credits created per dollar of stock price.

This is also consistent with the adjustment proposed by Lally (2004):

$$r_t' = r_t + UD \frac{C_{dist}}{DIV}, \quad (19)$$

11

where U is the value to the relevant investor of franking credits once distributed, D is the cash dividend yield, and C_{dist}/DIV is the ratio of distributed imputation credits to dividends paid. Note that U applies to franking credits that have been distributed, whereas γ applies to franking credits created, so $\gamma = U \times DR$ where DR represents the distribution rate, or the ratio of franking credits distributed to franking credits created $\left(DR = \dfrac{C_{dist}}{C_{created}} \right)$. Thus, Lally's adjustment can be written as:

$$ U \quad D \frac{C_{dist}}{DIV} = \frac{\gamma}{DR} \frac{DIV}{P_{t-1}} \frac{C_{dist}}{DIV} = \gamma \quad \frac{C_{created}}{P_{t-1}}. \tag{20} $$

which is identical to the Officer adjustment in Equation (18).

To establish the equivalence of our Equation (17) and the Officer/Lally adjustment in Equation (18), first note that the market return (after company tax) measured in the standard way is:

$$ r_t = r_f + MRP_{dc}. \tag{21} $$

The amount of corporate tax paid on this return (and hence the amount of franking credits created per dollar of stock price) is:

$$ r_t \frac{T}{1-T} = \left(r_f + MRP_{dc} \right) \frac{T}{1-T} = \frac{C_t}{P_{t-1}}. {}^{1} \tag{22} $$

Finally, the return including the value of franking credits can be written as:

$$ r_t' = r_f + MRP_{fc}. \tag{23} $$

Substituting Equations (21)-(23) into Equation 17 yields:

$$ r_f + MRP_{fc} = r_f + MRP_{dc} + \gamma \left(r_f + MRP_{dc} \right) \frac{T}{1-T}. \tag{24} $$

which implies that:

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[1] Here, we gross-up the after corporate tax return to a pre corporate tax return by dividing by $(1-T)$. Then we compute corporate tax paid by multiplying this pre-tax return by the corporate tax rate, T.

$$r_f + MRP_{fc} = \left(r_f + MRP_{dc}\right)\left(1 + \frac{\gamma\, T}{1-T}\right)$$

$$= \left(r_f + MRP_{dc}\right)\left(\frac{1-T(1-\gamma)}{1-T}\right),$$

(25)

which is equivalent to Equation (17).

That is, the value of franking credits must be added to the standard measure of the MRP. The required adjustment depends only on the assumptions made about the corporate tax rate and the value of franking credits.

4.   Consistency Between Parameters in Australian Practice

Having established the adjustment that is required to properly incorporate the value of franking credits and that our approach is exactly equivalent to the adjustment derived by Officer (1994) and Lally (2004), we now examine Australian corporate practice. Although use of the CAPM is widespread, little information is available about the individual parameter estimates that are adopted by individual participants. For this reason, we focus on regulatory determinations. Australian regulators have uniformly adopted the Officer (1994) framework for estimating the required return on capital. Their determinations also contain considerable detail about individual parameter estimates and the reasons for adopting them. Moreover, there are more than ten such regulatory bodies who collectively regulate infrastructure assets whose value exceeds $100 billion. This makes the Australian regulatory setting an ideal and important one in which to examine any cost of capital issue.

The goal of this section is two fold. First, we demonstrate that the set of parameter values that is commonly used in Australian corporate practice is inconsistent with Equation (17). That is, the parameters collectively are inconsistent with the framework to which they apply! Second, we examine various alternatives for restoring consistency. This requires a change to the value of at least one parameter. We examine how each parameter in turn would have to be adjusted in order to restore consistency and examine the reasonableness of each adjustment in light of external data.

4.1. Interpretation of current practice

It is common for the following parameter estimates to be used in Australian regulatory determinations: MRP $= 6\%$; $T = 30\%$; $\gamma = 0.5$. Also, assume that the relevant risk-free rate is 6%. It is unclear whether Australian regulators, in general, consider that this estimate of the MRP includes the value of franking credits. As most regulatory determinations ignore this issue, we separately examine each possibility in turn.

MRP = 6% incorporates the value of franking credits

If the 6% estimate of MRP is assumed to include the value of franking credits, Equation (17) implies that:

$$MRP_{fc} = \frac{r_f + MRP_{dc}}{(1-T)/[1-T(1-\gamma)]} - r_f$$

$$6\% = \frac{6\% + MRP_{dc}}{(1-0.3)/[1-0.3(1-0.5)]} - 6\%,$$

(26)

which implies that the MRP from dividends and capital gains (the standard measure) is only 3.9%. In other words, in the absence of dividend imputation, the average stock on the Australian equity market would be expected to earn a return from dividends and capital gains just 3.9% above the risk-free rate. This is unreasonable, considering the historical evidence.

For example, Dimson, Marsh and Staunton (2003) report that the average arithmetic mean of Australian equity returns (measured as dividends plus capital gains only) relative to Government bonds was 7.6% from 1900-2002 with a standard deviation of 19.0%, which is significantly different from 3.9% at a level of just 2%. And out of the 16 developed markets studied, they report that only two had a market risk premium of less than 3.9% (based on dividends and capital gains). Also, the data sources that are used to justify the estimate of 6% are generally based on dividends and capital gains only. For example, the Queensland Competition Authority recently adopted a 6% estimate "primarily on the basis of historical averaging methodology" in which franking credits are ignored entirely[2].

Moreover, this interpretation is also demonstrably inconsistent with observed dividend yields. If the risk-free rate is 6% and the MRP estimate of 6% is assumed to include the value of franking credits, the total return required on the market portfolio is 12% $(r_f + MRP = 6\% + 6\%)$. Recall that this is an after corporate tax return. We have shown in Section 3.2 that application of the results in Officer (1994) imply that if $\gamma = 0.5$ and $T = 30\%$ equity investors receive about 18% of their return from franking credits and the remaining 82% from dividends and capital gains. That is, the return from franking credits is assumed to be about 2.1% with the remainder coming from dividends and capital gains. If we further assume that franking credits, once distributed, are valued at about 60%

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[2] QCA. (2004). Draft Determination Regulation of Electricity Distribution, p. 98.

of face value[3], the yield of franking credits must be 3.5% $\left(\dfrac{2.1\%}{0.6}\right)$. That is, the average firm in the market portfolio must distribute franking credits with face value of 3.5% of the stock price. At a corporate tax rate of 30%, with every \$1 of dividends paid, franking credits of 43 cents $\left(\dfrac{T}{1-T}=\dfrac{0.3}{1-0.3}\right)$ can be distributed. Therefore, to generate a franking credit yield of 3.5%, the average firm must generate a dividend yield of 8.2% $\left(\dfrac{3.5\%}{0.43}\right)$. That is, a \$10 stock pays a dividend of \$0.82, with franking credits of \$0.35, if fully franked. This franking credit is then worth \$0.21 to the relevant investor. To the extent that not all dividends are fully franked, the aggregate dividend yield on the market portfolio would have to be even higher than 8.2%. Since the observed dividend yield on the market portfolio is an order of magnitude less than this, the assumptions of $\gamma = 0.5$, $T = 30\%$ and $MRP_{fc} = 6\%$ are dramatically inconsistent with observed market data.

Finally, note that foreign investors do not benefit from franking credits. Thus, setting the MRP to 6% including the value of franking credits is equivalent to assuming that foreign investors will provide capital in return for a 3.9% risk premium on the average stock. Since this is demonstrably less than what has been obtained in every other domestic market, it fails the test of economic reasonableness.

For all of these reasons, it seems impossible to sustain an argument that the 6% estimate of the MRP includes a 2.1% return from franking credits.

MRP = 6% reflects dividends and capital gains only

If the 6% estimate of MRP is assumed to exclude the value of franking credits, Equation (17) implies that:

$$
\begin{aligned}
MRP_{fc} &= \frac{r_f + MRP_{dc}}{(1-T)/[1-T(1-\gamma)]} - r_f \\
&= \frac{6\% + 6\%}{(1-0.3)/[1-0.3(1-0.5)]} - 6\% \\
&= 8.6\%.
\end{aligned}
\tag{27}
$$

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[3] Recall that gamma reflects (i) the rate at which the franking credits that are created by the payment of corporate tax are distributed to shareholders, and (ii) the value that the relevant shareholder places on each dollar of franking credits they receive. It is common to assume that about 80% of created franking credits are distributed and that, once distributed, franking credits are worth about 60% of face value to the relevant investor. ESCOSA document their use of a 60% estimate in the Draft 2005 - 2010 Electricity Distribution Price Determination and the QCA (2004) uses 62.5% in the Draft Determination Regulation of Electricity Distribution.

that is, the MRP including the value of franking credits is 8.6%.

However, this is also dramatically inconsistent with observed data on dividend yields. Recall that if $\gamma = 0.5$ and $T = 30\%$, about 18% of the total return comes via franking credits. Thus, the return from franking credits in this case is about 2.6%. Using the same logic as the previous case, a dividend yield of 10% is required to distribute sufficient franking credits to warrant this return.

Thus, however we interpret the MRP estimate of 6%, the standard set of parameter values produce results that are demonstrably inconsistent with each other and with observed data on dividend yields. In the remainder of this section, therefore, we explore ways of restoring consistency by altering parameter values.

4.2. Changing parameter values to restore consistency

$\gamma = 0$

Setting the value of franking credits to zero is the most straightforward and most complete way to restore consistency. In this case, a MRP of 6% is based on dividends and capital gains only. Observations pre- and post-imputation can be included in the same data set without adjustment. There are also no implications for how high or low dividend yields would have to be. Importantly, no other parameter estimates would have to change. Moreover, this is consistent with the most recent evidence from market data[4] and from dividend drop offs[5].

It is also perfectly consistent with observed market practice. Truong, Partington and Peat (2005) survey 356 listed Australian firms about various corporate finance practices. All firms were included in the All Ordinaries Index in August 2004, Australian and not in the finance sector. On the question of how franking credits were treated, 85% of respondents indicated that they made no adjustment for the value of franking credits.

Lonergan (2001) surveys expert valuation reports prepared in relation to takeovers. He reports that of 122 reports reviewed only 48 (or 39%) provided support showing how they had arrived at the WACC used in their reports. Of these, 42 (or 88%) used the CAPM to compute the cost of equity capital and made no adjustment for dividend imputation. Only six reports made any sort of adjustment to reflect dividend imputation. Furthermore, of the few reports that did make an adjustment for the value of franking credits, for all but one the ultimate effect on the value of the company was negligible or zero. Importantly, nearly half of Lonergan's sample is from after the

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[4] Cannavan, Finn & Gray (2004).
[5] Bellamy & Gray (2004).

1997 introduction of the 45-day rule that was introduced to prevent trading in franking credits, yet only one expert report from this period made any mention of the value of franking credits.

Lonergan (2001) also provides a list of conceptual grounds cited in reports for not adjusting for imputation credits, including:

- The value of franking credits is dependent on the tax position of each individual shareholder;
- There is no evidence that acquirers of businesses will pay additional value for surplus franking credits;
- There is little evidence that the value effects of dividend imputation are being included in valuations being undertaken by companies and investors or the broader market;
- Foreign shareholders are the marginal price-setters of the Australian market yet many such shareholders cannot avail themselves of the benefit of franking credits; and
- There is a lack of certainty about future dividend policies, the timing of taxation and dividend payments and consequently about franking credits.

Consequently, setting $\gamma = 0$ not only avoids the demonstrable internal inconsistency identified above, but it is also perfectly consistency with the dominant accepted market practice.

$MRP_{fc} = 0$

The next possibility to consider is a reduction in the estimate of the MRP. At the extreme, the all-inclusive MRP could be set to zero. This implies that the average firm earns a total return equal to the risk-free rate, 6% in this case. Once again, if $\gamma = 0.5$ and $T = 30\%$, about 18% of this return (or 1.1%) is due to franking credits. If franking credits are worth about 60% of their face value once distributed, a franking credit yield of 1.8% $\left(\dfrac{1.1\%}{0.6} \right)$ is required. This requires a dividend yield of 4.12% if all dividends are assumed to be fully franked. The actual dividend yield in the Australian market is relatively stable at around 4%, but not all of these dividends are fully franked. Thus, even when the all-inclusive MRP is set to zero, the dividend yield that is required to produce sufficient franking credits to justify setting gamma to 0.5 is above that which we observe in the market. Moreover, the absence of any sort of risk premium whatsoever is completely implausible so this solution must be rejected.

$0 < MRP_{fc} \le 8\%$

Having rejected the case in which the all-inclusive market risk premium is equal to zero, we consider a range of positive values for the market risk-premium before considering more specific cases in detail. Historically, Australian excess equity market returns (over and above the yield on

10-year government bonds) have averaged around 7% p.a. (Dimson, Marsh and Staunton, 2003). Some recent literature which infers the market risk premium from analyst expectations argues that the market risk premium is less than this historical average. For instance, Claus and Thomas (1999) estimate the market risk premium which is consistent with analyst earnings forecasts and market prices from 1985-1998. They report a mean estimate of 3.4% for the United States and 2.8% for the United Kingdom. Fama and French (2002) estimate the market risk premium at around 3-4% by estimating total returns as the sum of dividend yield and expected growth in dividends or earnings. In addition, Jorion and Goetzmann (1999) contend that survivorship bias makes the historical average equity premium an upwardly-biased estimate of the forward-looking premium.

The alternate view is that these effects have already been reflected in the 6% estimate that is commonly used in practice.[6] The mean MRP in Australia from 1883 - 2004 is 7.3%. Thus, an estimate of 6% is already well below the long-term mean. Moreover, there is no evidence of a recent reduction in the MRP. The mean MRP over the last 30 years (1975 - 2004) is 7.7%. The mean MRP in the 30 year pre-imputation period (1958 - 87) is 7.3% and the mean MRP in the post-imputation period (1991 - 2004) is 6.4%[7]. In all these cases, MRP is estimated from dividends and capital gains only. There is no statistical evidence of a reduction in the estimated MRP over time, nor any significant difference in the pre-and post-imputation period.

However, appropriate estimation of the MRP is beyond the scope of this paper. We simply attempt to reconcile *relative* estimates of MRP and gamma with observed dividend yields to highlight any internal inconsistencies. We do this for a range of values for the MRP from 0 to 8%. For each point in this range, we examine the full range of values for gamma – from 0 to 1. For each combination of MRP and gamma, we derive the minimum dividend yield that is required to produce the necessary volume of franking credits. For example, we have shown above that when the MRP is 6% and gamma is 0.5, a fully-franked dividend yield of 8.2% is required to produce a sufficient volume of franking credits to justify the 2.1% yield from franking credits that is implicit in the other parameter estimates. Figure 2 illustrates the minimum required dividend yield for a range of values for MRP and gamma.

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[6] Although this value is lower than the available data would suggest, it is consistent with Australian regulatory precedent and market practice as reported in Truong, Partington and Peat (2005).

[7] We omit the first few years of imputation in line with the conclusion of Brown and Clarke (1993) that the data from the introduction of imputation in 1987 through 1990 is not representative as "the market took some time to adjust to dividend imputation."

Figure 2: Required minimum fully-franked dividend yield under alternative assumptions for the market risk premium and the value of franking credits
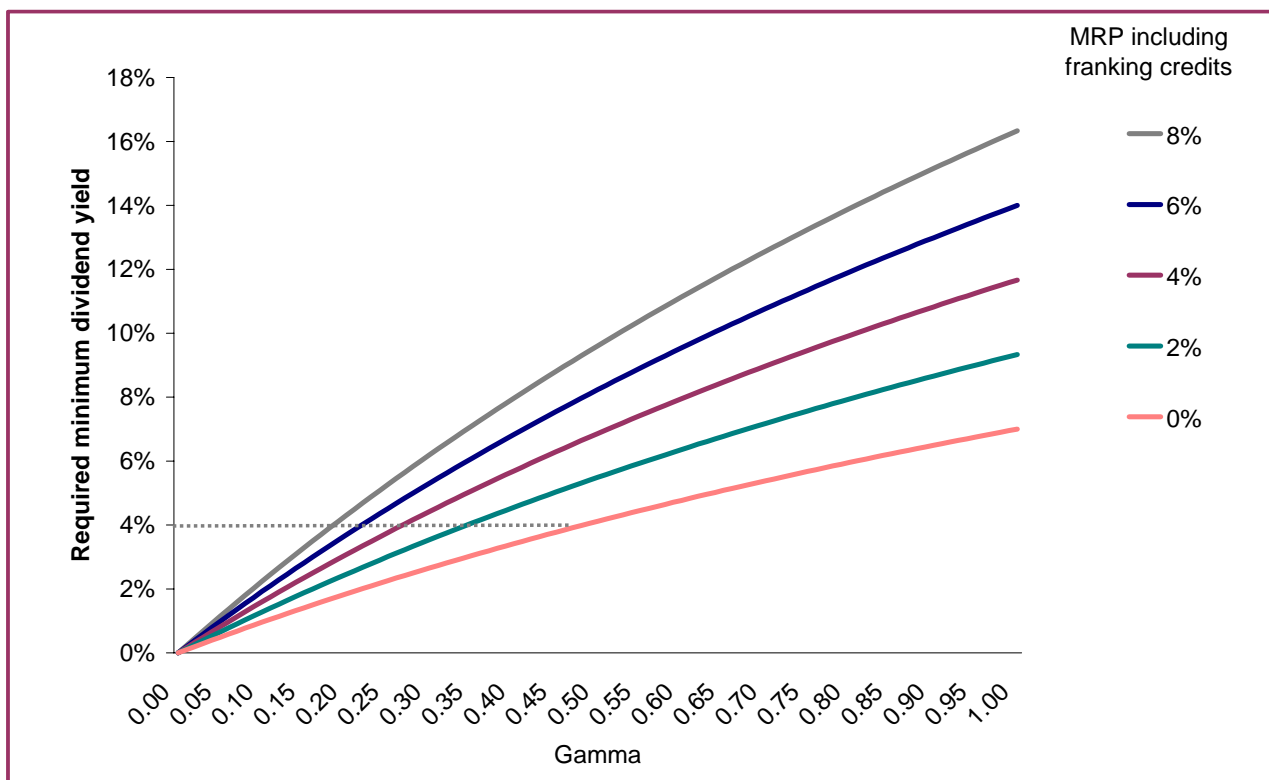
The first point to note from this figure is that gamma cannot be set to 0.5 or above. Even when the MRP is set to 0, a fully-franked dividend yield of at least 4.1% is required to produce the assumed volume of franking credits. For $\gamma = 0.5$ and a MRP of 4%, the fully-franked dividend yield must be more than 6%. The market simply does not distribute a sufficient volume of franking credits to justify setting gamma to 0.5.

At the other extreme, gamma may be set to 0. In this case, the minimum required dividend yield is, of course, zero. If franking credits are assumed to have no value to the relevant investor, there is no implicit assumption about how many franking credits must be distributed and therefore no constraint on the dividend yield. This also applies regardless of the value of the MRP. Thus, setting gamma to zero is consistent with any dividend yield that we observe and with any assumption about the MRP.

Now consider an intermediate point. Suppose that we set $\gamma = 0.25$ and MRP = 6%. In this case, the total expected return on the market is 12%, of which 1.2% comes from franking credits. A fully-franked dividend yield of 4.5% is required to distribute the required volume of franking credits in this case. Thus, setting $\gamma = 0.25$ and MRP = 6% is reasonably consistent with observed

dividend yields. What Figure 2 illustrates is that if MRP is set to 6%, the observed dividend yield constrains the value of gamma to 0.25 or less.[8]

Similarly, Figure 2 shows that if the MRP is set to only 4%, the maximum value of gamma that can be reasonably entertained, in light of observed dividend yields, is around 0.3. However, this implies that the expected market return is only 10% p.a., of which 1.1% comes from franking credits. This implies that dividends and capital gains provide a premium of only 2.9% relative to government bonds, which is so far at odds with any interpretation of the available data that it could not possibly be considered to be reasonable.

In summary, Figure 2 establishes that if gamma is set between 0 and 0.2, any value of the MRP between 0 and 8% is consistent with observed dividend yields. Conversely, if the MRP is set to 6% (consistent with practice), the maximum value of gamma that can be reasonably considered (in light of observed dividend yields) is 0.3. Higher values of gamma can co-exist with lower values of MRP, but on both scores this involves a move away from the empirical data and market practice. Consequently, we consider this to be nothing more than a theoretical possibility. Higher values of gamma and lower values of MRP are not inconsistent with observed dividend yields, but they are inconsistent with empirical estimates and market practice.

$T = 75\%$, $MRP_{fc} = 6\%$

Consistency with observed dividend yields can be restored if the relevant corporate tax rate is assumed to be 75%, and the 6% estimate of MRP is assumed to include the value of franking credits. In this case, the average firm earns a total return of 12% p.a., on average. The proportion of this total return that is due to franking credits is:

$$\frac{\gamma T}{1 - T(1 - \gamma)} = \frac{(0.5)(0.75)}{1 - 0.75(1 - 0.5)} = 60\%. \tag{28}$$

That is, franking credits yield a return of 7.2%. If franking credits are worth 60% of their face value once distributed, a franking credit yield of 12% $\left(\frac{7.2\%}{0.6}\right)$ is required. At a tax rate of 75%, franking credits of \$3.00 $\left(\frac{T}{1-T} = \frac{0.75}{1 - 0.75}\right)$ can be distributed with every \$1.00 of dividends. Thus, a dividend yield of 4% in line with observed values, would be required. Although consistency

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[8] Whether these are appropriate values for gamma and MRP is beyond the scope of this paper. That question must be determined with reference to the available empirical data. The point here is that given the value of one of these parameters, the observed dividend yield constrains the value of the other.

among parameters, and with observed dividend yields, is restored, a 75% tax rate is completely implausible so this approach must also be rejected.

If only a single parameter is to be changed, the only alternative is to set $\gamma = 0$. In the remainder of this section, we examine the possibility of simultaneously changing multiple parameters.

$\gamma = 0.35$, $T_{eff} = 15\%$, $T_{stat} = 30\%$, $MRP_{dc} = 6\%$

The final approach we examine sets $\gamma = 0.35$ and the MRP, excluding franking credits, to 6%. The latter assumption is consistent with observed data, after making a downward adjustment to reflect an assumed reduction in future MRP relative to past observations. The value of $\gamma = 0.35$ is from Hathaway and Officer (2004)[9]. We continue to use a statutory tax rate of 30%, which implies that 43 cents of franking credits $\left(\dfrac{0.3}{1-0.3} \right)$ can be distributed with each dollar of dividends. Finally, we use an effective tax rate of 15%. This suggests that Australian corporate taxes represent 15% of the corporate profits of Australian firms. The most plausible reason for the effective tax rate being lower than the statutory rate is that a portion of the profits are earned offshore and taxed in another jurisdiction. That is, the 15% rate is the proportion of Australian corporate tax (not total tax expense, which may include foreign taxes) to total corporate profit (which does include foreign-sourced profits.) However, if this were the only explanation, and if foreign corporate taxes were levied at 30%, half of all profits of Australian firms would need to be generated offshore. To the extent that the Australian corporate tax rate is relatively high, the proportion of foreign-sourced profits would have to be even higher.

Note that this cannot be reconciled by timing differences (e.g., generous depreciation allowances.) This is because we are dealing with an aggregate of all firms over time. Eventually, timing differences reverse, such that over a large sample of firms any such differences would be diversified away.

Finally, note that the total Australian corporate tax paid does represent less than 30% of the total profits of Australian firms. But this statistic is misleading in that minority interests are included in the pre-tax profit of the parent after tax has been paid by the subsidiary. Suppose, for example, that a subsidiary earns a pre-tax profit of $100, pays $30 corporate tax and distributes a $70 dividend. The 40% owner reports $28 (0.4×70) as pre-tax profit and does not subtract

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[9] Recall that the purpose of the current paper is to examine the consistency of parameter estimates. We do not address the appropriateness of the empirical techniques used to estimate gamma, nor the interpretation of the results. We merely examine whether it is possible to make this reported value consistent with other parameter values and external data on dividend yields.

corporate tax (as it has already been paid.) Thus, it appears as though some of the profits of the parent have not been taxed, when all corporate profits have actually been taxed when earned. That is, the appearance of a low effective tax rate is a measurement problem and has no economic substance. In a recent analysis, Buffini and Fabro (2005) report that the average tax rates of Australia's largest 150 listed firms is 27-28.5%.

In summary, the aggregate effective tax rate can only be as low as 15% if large amounts of Australian profits are earned (and taxed) offshore, inconsistent with observed data. This can be considered to be very much a lower bound.

Now, if the MRP from dividends and capital gains is 6%, the adjustment for the value of franking credits is:

$$
\begin{aligned}
MRP_{fc} &= \frac{r_f + MRP_{dc}}{(1-T)/[1-T(1-\gamma)]} - r_f \\
&= \frac{6\% + 6\%}{(1-0.15)/[1-0.15(1-0.35)]} - 6\% \\
&= 6.7\%.
\end{aligned}
\tag{31}
$$

Thus, the total required return on the market portfolio is 12.7%. Of this:

$$
\frac{\gamma T}{1-T(1-\gamma)} = \frac{(0.35)}{1-0.15(1-0.35)} = 5.8\%,
\tag{32}
$$

is due to franking credits. That is, the return from franking credits is 0.74%. If franking credits are worth about 60% once distributed, a franking credit yield of 1.5% $\left(\dfrac{0.74\%}{0.6}\right)$ is required. This requires a dividend yield of 3.5%, which is broadly consistent with observed yields. The key here is the accelerated distribution of franking credits—they are created by the payment of tax at 15%, but distributed in accordance with the statutory rate of 30%.

The advantage of this approach is that the estimate of γ and MRP is based on reported empirical evidence. The assumption of an effective tax rate of 15%, however, is extreme and implies that a very large proportion of Australian corporate profits must be sourced offshore.

Conclusions

In this section, we have reviewed a number of methods for restoring consistency between parameters and with observed data on dividend yields. Setting $\gamma = 0$ is the simplest approach, it completely eliminates all inconsistencies, it is consistent with the most recent published evidence,

and is consistent with the dominant market practice of corporate finance professionals and valuation experts.

5.   Empirical Adjustments to MRP estimates

Some attempts have been made to adjust estimates of the MRP to reflect the assumed value of franking credits. Some details relating to two such approaches have been provided by Australian regulators. Again, we use data from the regulatory setting because regulators, in contrast to other market participants, provide explicit parameter estimates. The following two examples highlight that, even in the cases where the estimated market risk premium explicitly incorporates an adjustment for franking credits, that adjustment is inadequate, given the typical assumption that $\gamma = 0.5$. To be consistent with observed returns from dividends and capital gains, either a lower value for γ should be assumed, or a larger adjustment to the MRP is required.

In the Review of Gas Access Arrangements Final Decision (2002, p. 324), the Victorian Essential Services Commission (ESC) implicitly notes that there are three components to the equity return: dividends, capital gains and franking credits. The standard way in which equity returns are measured is in terms of dividends and capital gains only. Thus, the value of franking credits must be added to any such measure (to the extent that franking credits have any value to the relevant investor). The ESC reports that (p. 324), "its assumption about the value of franking credits requires an upward adjustment to the measured cash equity premium to add back the non-cash value of franking credits since 1987—which the Commission has estimated to add 0.2 percentage points onto the long term average." Further calculations indicate that this adjustment was applied by adding around 0.86% to each observation post 1987, thus increasing the average observed MRP from 1950 by 0.2%. Since this affects 14 of 55 observations, each of those 14 observations must be higher by around 0.86% to cause the average over 55 observations to rise by 0.2%. That is, the ESC values franking credits as providing a return of around 0.86% p.a. for the average stock (with an equity beta of 1). The Essential Services Commission of South Australia (ESCOSA) (2004, p. 179) has performed a similar adjustment reporting that, "if the non-cash value of franking credits for the period since 1987 are included" the mean MRP over 1882 - 2001 increases by 0.1%. Since this affects 14 of 120 observations, each of those 14 observations must be higher by around 0.86% to cause the average over 120 observations to rise by 0.1%. That is, like the ESC, ESCOSA also values franking credits as providing a return of around 0.86% p.a. for the average stock (equity beta of 1).

Although neither regulator provides any detail about how this 0.86% p.a. return is calculated, it is possible to reverse engineer. The aggregate dividend yield for the Australian market is around 4%. Given that around 10% of dividends are unfranked and that very few dividends are partially

franked, the yield of fully franked dividends is around 3.6% p.a. Since the ratio of franking credits to dividends is 0.43:1 at a 30% tax rate, the yield of franking credits is about 1.7% p.a. $(0.43 \times 3.6\%)$. If these franking credits are valued at around 60% of face value once distributed[10], they add around 0.86% p.a $(0.6 \times 1.7\%)$ to market returns.

However, this adjustment is demonstrably inconsistent with the maintained assumptions of $\gamma = 0.5$ and $T = 30\%$. To see this, note that if the value of franking credits is 0.86% and if $\gamma = 0.5$, then the total amount of franking credits created (expressed as a percentage of equity value) must be $\frac{0.86\%}{0.5} = 1.72\%$. Since franking credits are created by the payment of Australian corporate tax, this also represents the amount of tax paid. Thus, the average company return before corporate tax must be 5.73% $\left(\frac{1.72\%}{0.3}\right)$, generating tax of 1.72% and an after company tax of return of only 4.01%. These values are all expressed as a percentage of the equity value. If expressed as a percentage of total firm value, they are even lower! Clearly these implied returns are economically unreasonable.

Internal consistency demands that parameters be adjusted as illustrated in Section 4. Setting $\gamma = 0$ is the most straightforward adjustment, is consistent with the empirical evidence, and requires no adjustment to market returns whatsoever.

The ESC has also sought to adjust its "ex-ante" estimates of MRP to account for the assumed value of franking credits. In the Electricity Distribution Price Review Draft Decision (2000, p. 156-8), the ESC notes that a "grossed-up" dividend yield, that includes the assumed value of franking credits, must be used. This implies that the return to equity-holders is:

$$r_e = \frac{D_o}{P_o}\left[\frac{1 - T(1 - \gamma)}{1 - T}\right] + g \tag{33}$$

where $\frac{D_o}{P_o}$ is the current dividend yield and g is the perpetual growth rate of dividends (and earnings if the payout ratio is assumed to be constant). As well as applying to individual stocks, this relationship also applies to the market in aggregate. In this case, the dividend yield and growth rate are interpreted as market wide estimates.

Using estimate of $\gamma = 0.5$ and $T = 30\%$, and a dividend yield of 4% (consistent with recent data), the expected return on the market portfolio is:

$$r_m = 4\%(1.21) + g \hspace{3cm} (34)$$
$$= 4.86\% + g.$$

Subtracting the risk-free rate from both sides yields:

$$MRP = r_m - r_f = 4.86\% + g - r_f. \hspace{2cm} (35)$$

The ESC then assumes that the growth rate is equal to the risk-free rate, giving a MRP estimate of 4.86%. At a risk-free rate of 5.72%, the expected return on the average stock is 10.6%. This 10.6% expected return is made up of three components, including (i) Dividend 4% p.a.; (ii) Franking credits 0.86% p.a.; and (iii) Capital gains 5.72% p.a.

Once again, the adjustment for the value of franking credits is demonstrably inconsistent with the maintained assumptions of $\gamma = 0.5$ and $T = 30\%$. If franking credits have a value to investors of only 0.86% the average firm must return only 4.01% after company tax which equates to 5.73% before company tax. Consider a $100 stock. The company generates pre-tax earnings of $5.73, pays tax of $0.3 \times 5.73 = \$1.72$ and creates franking credits worth $1.72. It then pays a dividend of $4.00 and attaches the $1.72 franking credit. (Note that $4.00\dfrac{0.3}{1-0.3} = 1.72$.) This credit is then worth 0.86 to the recipient. Since the value of the credit equals half the amount of credits created this is consistent with $\gamma = 0.5$. Clearly, a 4% after-tax return is economically unreasonable. It is also inconsistent with the ex-ante model, because there are no residual earnings to be reinvested to generate future growth. Thus, there is no scope for any capital gain component of returns, so $g = 0$. However, we cannot consider a higher return, because then more tax would be paid and more franking credits would be created and this would be inconsistent with the assumption that $\gamma = 0.5$. Noting that not all franking credits are immediately distributed does not help either. This is because gamma is the ratio of the value of franking credits to the amount of credits created not distributed.

That is, the combination of parameters that has been assumed is simply impossible to sustain, given an observed dividend yield of around 4%.

6. Conclusions

In this paper, we use several approaches to formally derive the mathematically deterministic relationship that exists between the cost of capital parameters under the Officer (1994) framework. This same relationship applies regardless of whether the value of franking credits is reflected in the discount rate or the cash flows. The relationship we derive is exactly equivalent to that derived, in different ways, by Officer (1994) and Lally (2004).

We further demonstrate that the parameter values that have been adopted as standard in Australian regulatory determinations violate this relationship. The parameters are collectively inconsistent with each other and with external data on dividend yields. Thus, one or more parameter estimates must be changed in order to restore internal consistency. We examine several possible parameter changes and note that most of these possibilities require that at least one parameter be set at an economically implausible value (75% corporate tax rates, for example.)

Our examination of regulatory practice is driven by the fact that (i) it is economically important, with more than $100 billion of infrastructure assets being regulated; and (ii) the regulatory process is transparent in the sense that individual parameter values are made available. Corporate practice is obviously less transparent in this regard.

The evidence we present on typical parameter estimates is from the regulatory setting, because of its transparency. Parameter estimates used by equity analysis and individual bankers are expected to vary more widely and we are loathe to make assumptions about "typical" estimates, given the lack of available data. However, the corporate situation where parameter estimates are made explicitly is expert valuation reports produced during takeover proceedings. These reports always contain a discounted cash flow valuation of the target firm. The standard practice is to make no adjustment to the cash flows or the discount rate to reflect the value of franking credits. This is equivalent to setting $\gamma = 0$, which is consistent with the empirical evidence relating to Australian listed firms. It also restores the internal consistency among cost of capital parameters and with external data on dividend yields. Since this is also the simplest adjustment to make to the standard set of regulatory parameters and is the most economically reasonable, we suggest that the corporate approach should be generally adopted.

This means that no adjustment for franking credits is required when estimating the MRP. Moreover, it enables pre- and post-imputation observed market returns to be added together as equivalent units, which is practically important given the long data sets required to estimate this parameter.

If however, franking credits *are* assumed to have value, it is essential that the cost of capital parameters are shown to collectively satisfy the relationship in Equation (17) and be consistent with the observed data on dividend yields. To date, this challenge (or minimum requirement) has not been met by Australian regulators.

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