THE COST OF CAPITAL OF A COMPANY UNDER AN IMPUTATION TAX SYSTEM

by

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Abstract:

One of the issues arising out of the introduction of an imputation tax for companies in Australia is the effect it is likely to have on the definition and measurement of a company's cost of capital. Insofar as there is a difference between the value of a dollar of franked relative to unfranked dividends, conventional definitions for the cost of capital are inappropriate and new definitions are required. This has implications for the measurement of a company's cost of capital and for the definition of net cash flows that are used in conjunction with the cost of capital. This paper sets out these definitions and an approach for measuring the cost of capital.

The new definition of the cost of capital replaces the effective company tax rate T with $T(1 - \gamma)$ where γ is the value of personal tax credits. Further, the definition of the risk premium in the capital asset pricing model requires an adjustment for the capitalized value of personal tax credits to maintain consistency between the cost of capital and cash flows which are defined on an after-company tax but before-personal tax basis.

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Introduction

Australia has had a full imputation tax system for companies since July 1, 1987. Before this date the Australian corporate tax system was a classical tax system, the same as in the USA. Both Australia and New Zealand have full imputation tax systems; many other countries have a partial imputation system where only partial credit is given for the company tax.

Under an imputation tax system, credit is given to shareholders for the company tax implicitly levied on their dividend receipts, i.e. dividends are paid after company tax has been levied which implies that the dividends have been taxed at the company level. Under a full imputation tax system, tax that is implicitly being levied on the dividends can be credited against any further tax lliabilities of the shareholder (the recipient of the dividend).[1]

The proportion of company tax that can be fully rebated against personal tax liabilities is best viewed as personal income tax collected at the company level. In effect, the tax collected at the company level is a mixture of personal tax and company tax, the company tax being that proportion of the tax collected which is not credited (rebated) against personal tax. If all the collection of tax from a company is rebateable, (in the Australian terminology if all the franking credits can be used against personal tax liabilities), then for that company's shareholders, company tax is effectively eliminated. The tax the company pays is simply the shareholders' personal income tax being collected at the company level.

One of the most vexing questions in relation to the change in the company tax system is its effect on estimates of a company's cost of capital. The standard analysis of a company's cost of capital, that appears in most textbooks on corporate finance, implicitly assumes a classical company tax system.

There are two basic issues associated with a change in the company tax system to an imputation tax as it affects the cost of capital for a company:

(i) What is the appropriate definition of a company's cost of capital? Most importantly, what is the implied definition of the cash flows consistent with that cost of capital?

(ii) How should a firm's cost of capital be measured?

The cost of capital reflects the required return by providers of capital and in this context, it is akin to a price. As such it will vary with supply and demand conditions in the capital market. Further, Australia's capital market is open so that Australian companies' costs of capital will be determined, in part at least, by world market conditions. However, the question still remains as to whether the measurement of this required return will differ under an imputation tax relative to a classical tax. Moreover, insofar as it is only the

1. A more complete description of the imputation tax system in Australia, its effect on various classes of investor, and its likely effect on dividend and financing policies of Australian companies is discussed by Officer (1990).

equities' return which is affected by an imputation tax system, it is the measurement of the cost of equity capital which is at issue.

The paper sets out the definitions of the costs of capital and appropriate net cash flows on a before and after company tax basis but before personal taxes. An appendix illustrates the definitions with a numerical example. The example is contrived and it is not intended to be a proof of the propositions developed in the paper. The paper also demonstrates the effect of the imputation tax on the measurement of the risk premium in the Capital Asset Pricing Model (CAPM), when that model is defined on an after company tax but before personal tax basis.

There are versions of the CAPM and definitions of the cost of capital e.g. Ashton (1989), which have been derived on an after personal tax basis. Such models are difficult to test empirically and, therefore, difficult to use because most securities are traded on an after company but before personal tax basis. The exception is equities under an imputation tax system but even in this case it is difficult to use an after-personal tax model because usually only *some* of the value of the personal tax liability is captured in the traded price. Also, such approaches are not consistent with, nor readily reconcilable with, the approaches adopted for a classical tax system. The approach outlined in this paper overcomes both of these problems.

(i) Definition of a Firm's Weighted Average Cost of Capital

The operating income (earnings before interest and taxes) of a company is distributed amongst three claimants – the government, the debtholders (creditors) and the residual claimants or equity holders. It is implicitly assumed that all other costs associated with the production process have been paid out of revenues before the determination of operating income. In effect, operating income is that component of a company's revenues which is left to service its obligations to government and the providers of the company's capital, which in the first instance are the debtholders and then the residual claimants or shareholders[2]. This distribution of operating income is described in equation 1 below.

$$X_O = X_G + X_D + X_E \tag{1}$$

where
X_O is operating income,
X_G is the government's share of operating income,
X_D is the debtholders' share of operating income, and
X_E is the equity holders' share of operating income.[3]

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2. The obligations to government typically are paid and rank after debtholders.
3. In the context that these variables are listed in this paper they are assumed to be perpetuities, i.e. constant amounts per period in perpetuity. In a practical context, they can be assumed to be perpetuity equivalent. The assumption is employed, explicitly or more typically implicitly, by all the conventional definitions of the cost of capital.

The amount of tax collected from the company by the government is found by applying the effective tax rate (T) to the operating income less interest, i.e. $X_O - X_D$.

This amount, i.e. $T(X_O - X_D)$, represents the amount of tax collected from the company but not all of this is company tax[4]. A proportion (γ) of the tax collected from the company will be rebated against personal tax and, therefore, is not really company tax but rather is a collection of personal tax at the company level. Therefore, if we wish to define the effective company tax collection, we need to reduce T by the proportion γ.

In these circumstances, the effective level of company tax paid, X_G, is defined by

$$\begin{aligned} X_G &= T(X_O - X_D) - \gamma \cdot T(X_O - X_D) \\ &= T(X_O - X_D)(1 - \gamma) \end{aligned} \tag{2}$$

where

T is the tax rate effective for the definition of assessable income as defined in (2), it is the effective tax rate which is levied at the company level and it is a mixture of company tax, $T(1 - \gamma)$, and personal tax, $T \cdot \gamma$, i.e. $T = T(1 - \gamma) + T\gamma$. Thus γ is the proportion of tax collected from the company which gives rise to the tax credit associated with a franked dividend. This franking credit can be utilized as tax credit against the personal tax liabilities of the shareholder. γ can be interpreted as the value of a dollar of tax credit to the shareholder.[5]

Further $X_E = X_E' + \gamma T(X_O - X_D)$ represents profit going to shareholders and consists of dividends, X_E', plus the value of franking tax credits, $\gamma \cdot T(X_O - X_D)$.

Equation (2) distinguishes an imputation tax from a classical tax with respect to the amount of tax paid at the company level where $X_G = T(X_O - X_D)$. It has already been pointed out that under an imputation tax a proportion of the tax paid at the company level, $\gamma \cdot T(X_O - X_D)$, is really a withholding of personal tax and therefore to correctly define after company tax income this amount must be added back to equity income.

A. *The Before-Tax Cost of Capital*

Recalling equation (1):

$$X_O = X_G + X_D + X_E \tag{1}$$

4. In this context, company tax is defined as that tax paid by an entity because it is in a company structure as distinct from being held personally or in a partnership structure.
5. For example, if the shareholder can fully utilize the imputation tax credits then ("value") $\gamma = 1$, e.g. a superfund or an Australian resident personal taxpayer. On the other hand a tax exempt or an offshore taxpayer who cannot utilize or otherwise access the value in the tax credit will set $\gamma = 0$. Where there is a market for tax credits one could use the market price to estimate the value of γ for the marginal shareholder, i.e. the shareholder who implicitly sets the price of the shares and the price of γ and the company's cost of capital at the margin, but where there is only a covert market, estimates can only be made through dividend drop-off rates; see Hathaway and Officer (1992).

and substituting for X_G from equation (2) we get:

$$X_O = T(X_O - X_D)(1 - \gamma) + X_D + X_E \quad (3)$$

Collecting X_O on the LHS of the equation and simplifying we get:

$$X_O = \frac{X_E}{(1 - T(1 - \gamma))} + X_D \quad (4)$$

Further, in order to derive the standard form of the cost of capital it is necessary to adopt perpetuity definitions of value. Therefore define:

(a) $$S = X_E/r_E$$

where

S is the value of equity (shares),

r_E is the required rate of return to equity holders after-company tax but before-personal tax, and

X_E is the perpetuity equivalent of the share of operating income that goes to equity holders. It effectively adds back the value of imputation tax credits (also on a perpetuity equivalent basis) to give an after-company but before-personal tax definition of income.

Define:

(b) $$D = X_D/r_D$$

where

D is the value of debt,

X_D is the perpetuity equivalent of debtholders' share of operating income,

r_D is the required return to debtholders, i.e. the cost of debt capital.

In the context of a before-tax cost of capital define:

(c) $$V = X_O/r_O$$

where

X_O is the perpetuity equivalent of operating income and

r_O is the required return before taxes or the before-tax weighted average cost of capital (WACC).

Therefore substituting definitions (a) through (c) in equation (4) we get:

$$r_O = \frac{r_E}{(1 - T(1 - \gamma))} \cdot \frac{S}{V} + r_D \cdot \frac{D}{V} \quad (5)$$

B. The After-Tax Cost of Capital

The appropriate definition of a company's after-tax weighted average cost of capital (WACC) is determined by the definition used of after-tax operating income or really after-tax net cash flows (the terms are used synonymously here). Four alternative definitions of after-tax net cash flows (income) are considered:

(i) $X_O(1 - T)$, which is the standard after-tax definition of cash flows that is most frequently used. It assumes all operating income is taxed at the effective company tax rate.

(ii) $X_O(1 - T(1 - \gamma))$, which assumes that all operating income is taxed at the effective company tax rate but a proportion, γ, is really a withholding of personal tax; therefore, to obtain an effective after-company tax income this proportion must be subtracted from the tax collected from the company.

(iii) $X_O - T(X_O - X_D)(1 - \gamma)$, which represents the effective after-company tax income attributable to providers of capital (equity holders plus debtholders). It takes account of the tax deductibility of debt and the tax credits available under the imputation system.

(iv) $X_O(1 - T) + \gamma \cdot T(X_O - X_D)$, which is equivalent to the definition of the after-company tax income under a classical tax with the value of tax credits added back.

(i) WACC where the after-tax net cash flows are defined as $X_O(1 - T)$.

Solving for $X_O(1 - T)$ in equation (3) we get:

$$X_O(1 - T) = X_E + X_D(1 - T(1 - \gamma)) - \gamma \cdot T \cdot X_O \tag{6}$$

Further, if we define:

(d) $$V = X_O(1 - T)/r_i$$

and then substitute in equation (6) for X_E, X_D and $X_O(1 - T)$ from definitions (a), (b) and (d) we get:

$$r_i = r_E \cdot \frac{S}{V} \cdot \frac{(1 - T)}{(1 - T(1 - \gamma))} + r_D \cdot \frac{D}{V}(1 - T) \tag{7}$$

It should be noted that the comparable definition of WACC for a classical tax system under the same definition of after tax net cash flows is:

$$r_i^C = r_E \cdot \frac{S}{V} + r_D \cdot \frac{D}{V} \cdot (1 - T) \tag{8}$$

A comparison of equations (7) and (8) and their respective definitions of after tax net cash flows indicates that if $\gamma = 0$, i.e. the tax credits have no value, then there is no difference between the WACCs under a classical or an imputation tax system.

(ii) WACC where the after-tax net cash flows are defined as $X_O(1 - T(1 - \gamma))$

Solving for $X_O(1 - T(1 - \gamma))$ in equation (3) we get:

$$X_O(1 - T(1 - \gamma)) = X_E + X_D(1 - T(1 - \gamma)) \tag{9}$$

Further define:

(e) $$V = X_O(1 - T(1 - \gamma))/r_{ii}$$

Adopting the above definitions (a), (b) and (e) and substituting in equation (9) enables us to derive the equation for the after-tax WACC under an imputation tax, i.e.

$$r_{ii} = r_E \cdot \frac{S}{V} + r_D(1 - T(1 - \gamma))\frac{D}{V} \tag{10}$$

The comparable definition of WACC under a classical tax has already been defined as equation (8).

A comparison of equations (10) and (8) shows that if γ is equal to zero then (10) collapses into (8) and there is no difference between WACC under an imputation tax and WACC under a classical tax.

(iii) WACC where the after-tax net cash flows are defined as $X_O - T(X_O - X_D)(1 - \gamma)$.

Adopting the definition of operating income defined by equation (3), i.e. where the government's share of tax (X_G) is defined to include the effective company tax but not any personal tax, and solving for:

$$X_O - T(X_O - X_D)(1 - \gamma) = (X_O - X_D)(1 - T(1 - \gamma)) + X_D = X_E + X_D \tag{11}$$

and adopting the previous definitions of rates of return, i.e. r_E and r_D and defining:

(f) $$V = [X_O - T(X_O - X_D)(1 - \gamma)]r_{iii}$$

then

$$r_{iii} = r_E \cdot \frac{S}{V} + r_D \cdot \frac{D}{V} \tag{12}$$

The WACC (r_{iii}) is appropriate as the discount rate for cash flows where the cash flows are defined as above. Using this definition of WACC the tax advantages of an imputation tax are reflected in the definition of after-tax net cash flows.

(iv) WACC where the after-tax net cash flows are defined as $X_O(1-T)+\gamma \cdot T(X_O-X_D)$

Solving equation (3) for the above definition of after-tax net cash flow we get:

$$X_O(1-T)+\gamma \cdot T(X_O-X_D) = X_E + X_D(1-T)$$

and defining:

(g) $$V = [X_O(1-T)+\gamma \cdot T(X_O-X_D)]/r_{iv}$$

then $$r_{iv} = r_E \cdot \frac{S}{V} + r_D(1-T) \cdot \frac{D}{V} \qquad (13)$$

which is equivalent to the after-tax cost of capital under a classical tax where the after-tax cash flows are defined as $X_O(1-T)$.

In this formulation the after-tax definition of cash flows has the value of the imputation credit, i.e. $\gamma \cdot T(X_O-X_D)$, added back. In many ways this formulation may be the easiest to work with since it requires only a change in the definition of cash flows but the "old" definition of the cost of capital can be used.

(ii) Measurement of the Cost of Capital

The cost of capital is the expected or required rate of return on capital adjusted for time and risk; it is an opportunity cost. For fixed interest securities, this rate of return is usually taken as a redemption yield on the security that has a promised "coupon" and is to be held until its redemption date. That is, given the security's value, it is the internal rate of return on the security, although this ignores default risk; see Officer (1981) for a discussion. For equity securities, where there is no such contract relating to payment or redemption, typically, the historical rates of return are used to derive an estimate of the expected rate of return.

Under an imputation tax, the expected return on debt securities is derived in the same manner as under a classical tax system, i.e. the imputation tax is not expected to directly affect the yields on debt. In contrast, equity returns will be affected because a proportion of the return on equity under an imputation tax represents credits against personal tax.

It is important to note that this does not imply that an imputation tax affects the cost of equity capital, which is measured on an after-company tax basis but before personal tax. In an open capital market, such as Australia, where the size of the market relative to offshore markets implies it is a price taker, we would not expect the cost of capital to change – the arguments to support this proposition have been made in Officer (1988)[6]. However, this

6. In open and frictionless capital markets, the risk-adjusted returns to investors after all taxes other than personal taxes will be equated, otherwise there would be opportunities for arbitrage. However, this does not imply some measures of the cost of capital will not change with a change in taxes. Those definitions which include some elements of tax will change.

does not imply that measured rates of return, as they are usually measured, have not altered.

Under the classical tax system, the after-company tax rate of return on equity will be measured for the single period t – 1 to t as:

$$r_t^c = (p_t - p_{t-1} + d_t)/p_{t-1} \tag{14}$$

where

r_t^c is the equity rate of return observed under a classical tax system,

p_t is the price or value per share at the end of the period t,

p_{t-1} is the price or value per share at the start of period t, and

d_t is any cash flow per share, e.g. a dividend, assumed to occur at the end of period t.

In contrast, under an imputation tax, the value, p_t, or the value of dividends, d_t, will reflect (capitalize) the value of any tax credits which reflect a pre-payment of personal tax. Therefore, equation (14) under the imputation system becomes, assuming dividends including imputation credits are paid:

$$r_t' = (p_t - p_{t-1} + d_t + \gamma \cdot C_t)/p_{t-1} \tag{15}$$

where

r_t' is an after-company but before personal tax rate of return as in (14) but under an imputation tax system.

γ has been previously defined.

C_t is the amount of tax credits per share distributed at time t.

d_t is a dividend (franked, partially franked or unfranked) per share.

However, if the conventional measure of rates of return is:

$$r_t = (p_t - p_{t-1} + d_t)/p_{t-1} \tag{16}$$

So that an adjustment is required for the value of the tax credits i.e.

$$\begin{aligned} r_t' &= r_t + \gamma C_t/p_{t-1} \\ &= r_t + \tau_t \end{aligned} \tag{17}$$

where

τ_t is the value of tax credits expressed as a rate or proportion of the initial value of the share.

Thus under an imputation tax equation (17) measures returns after company tax but before personal tax, whereas, under a classical tax system, equation (14) measures returns after company tax but before personal tax.

For example, when the Capital Asset Pricing Model (CAPM) is used to derive estimates of required returns to equity and we are using observed market rates (r_{jt}) determined under an imputation tax, the value of the tax credits should be reflected in returns, so that:

$$E(r'_{jt}) = r_{ft} + [E(r_{mt} + \tau_{mt}) - r_{ft}]\beta_j \tag{18}$$

i.e. the required return on equity is a function of $E(r'_{mt})$, the expected return on the market portfolio after-company but before-personal tax. $E(r'_{mt})$ is equal to $E(r_{mt})$, the expected observed rate of return on the market portfolio, plus the value of tax credits (τ_{mt}) in the market portfolio.

This raises the important question of whether we can use conventional measures of the risk premium, such as an x percent premium over the risk free rate, when the x percent is based on historical rates under a classical tax system. If the imputation tax does *not* affect the cost of capital on an *after-company tax basis* as I have argued, then we could estimate $E(r'_{jt})$ using historical rates estimated under a classical tax regime. However, where estimates of returns are derived under an imputation tax using equation (16), some personal tax payments will be capitalized into the risk premium which consequently will be lower. In these circumstances, an adjustment (add τ) will be needed to include the personal tax credits so that the cost of equity capital is calculated to reflect an *after-company tax* but *before personal tax* return consistent with the definition of cash flows.

A question that might arise when measuring the costs of equity capital is: if the imputation tax credits are traded along with the price (capitalized into the price of the securities) and if we have a measure of the value of a dollar of imputation tax credit (γ), why cannot we define the cash flows and costs of capital after-company tax and after the element of personal tax paid by the company? Such an approach, if feasible, would enable us to ignore the element of personal tax paid by the company and we could proceed as under a classical tax.

However, this approach is not feasible because the level of personal withholding tax, paid at the company level, will vary between firms and between the firm and the market portfolio. Therefore, specific recognition of this fact is required in the level of franked dividends paid. Ignoring the relative proportion of franked dividends (relative to total dividends) will create errors because a franked dividend is clearly worth more than an unfranked dividend insofar as $\gamma > 0$.

Therefore, differences in the values of franked and unfranked dividends and differences in the proportions of franked dividends paid require specific recognition. Conventional measures of the costs of equity capital, where these differences are not recognised in either the net cash flow or in the discount rate (WACC), are inappropriate.

(iii) In Conclusion

The effect of the imputation tax system on a company's investment evaluations can require adjustment of cash flows and/or the cost of capital. The adjustment is conceptually simple.

Either the net cash flows and/or the WACC need adjusting for the value of the franking tax credits. The principles involved are clearly demonstrated by the after-tax definition of net cash flows (ii) where the after-company tax cash flows require the *value* of the franking tax credit to be added back to the after-tax cash flows and the tax deductibility of debt suitably reduced because debt, under an imputation tax, is less effective as a tax shield. Similarly, for estimates of the expected or required returns to equity, the value of the personal tax benefits will need to be added back to the observed rates which are lower because of the capitalized value of such personal tax benefits.

On a before-tax basis, the WACC, through the cost of equity capital, is reduced by the relative value of tax credits compared to the cost of equity capital under a classical tax system, because the implied lower tax on equity under an imputation tax requires less "grossing-up" to go from an after-tax cost of equity capital to a before-tax cost of equity capital.

Appendix

The following example illustrates the consistency between the various definitions of the cost of capital when they are used with the appropriate definition of net cash flows.

The example is contrived to illustrate the use of the formulae; it is not a proof. It is designed to help the reader through some of the obstacles to going from theory to practice.

The example also contrasts the equations of the cost of capital under a classical tax system with those of an imputation tax system. In the example, it has been assumed that the value of imputation tax credit raises the value of shares which, of course, raises the value of the assets under the control of the company. The example does *not* illustrate the effect of introducing an imputation tax on dividend policy, financing or capital structure decisions.

McKelly Corporation

Balance Sheet

		$
Authorised Capital		
50,000,000 ordinary shares of 50 cents each		25M
Issued Capital		
40,000,000 ordinary shares of 50 cents each		20M
Reserves		
Share Premium Account		5M
Capital Profit Reserves		10M
Asset Revaluation Reserve		5M
General Reserves		10M
Share Capital and Reserves		50M
Non Current Liabilities		
Debenture Stock	(Note 1)	9.96M

Term Loans	(Note 2)	15M
Unsecured Notes	(Note 3)	5M
Contingency for Product Liability		0.04M
		30M
Current Liabilities and Provisions		
Trade Creditors		10M
Bank Overdraft	(Note 4)	5M
Unsecured Loans payable within 12 months	(Note 5)	1M
Mortgage Loans	(Note 6)	2M
Provisions for:		
Income Tax		3M
Long Service Leave and Holiday Pay		3M
Unpaid Dividends		2M
		26M
Total Capital, Liabilities and Provision		106M
Assets		
Non Current Assets		
Fixed Assets		70M
Intangible Assets		12M
Investments		
Loans		10M
Current Assets		
Stock on Hand		5M
Trade Debtors		4.5M
Short Term Deposits		4M
Cash on Hand		0.5M
Total Assets		106M

Notes

1. 1M, $9.96 debentures, due in 5 years, rate paid on the debentures is 10 percent per annum, paid annually.
2. The average duration of the term loans is 3 years and the average rate paid on the loans is 15 percent per annum.
3. 1M, $5 unsecured notes paying 17 percent per annum and redeemable in 2 years.
4. This is the standard level of overdraft maintained by the company; current overdraft interest rate is 14 percent per annum.
5. These are loans which will be repaid in two months. They will not be renewed. They have been replaced by a recent issue of unsecured notes (see Note 3) and as a consequence they should not be included in the capital base for any cost of capital measure.
6. Mortgage loans payable in 6 months. The interest rate is 10 percent per annum. They will be replaced by comparable loans which currently have an interest rate of 15 percent per annum.
7. All debt is assumed to be "ex-coupon" or interest payment on balance date.

Profit and Loss Statement

	Sales		150M
less			
	Cost of goods sold		85.04M
	Wages, directors' fees etc.		14M
	Depreciation		10M
	Provisions		1M
	Profit from operations (EBIT)	(X_O)	39.96M
less			
	Income tax expense	(X_G)	13.58M
	Interest paid	(X_D)	5.14M
	Dividends paid }		16.24M
	Transfer to General Reserves }	(X_E)	5.00M

Assume:

1. The β risk of McKelly Corp. shares is 1.2.
2. The expected risk premium on the market for equities is 6.0 percent over the risk-free rate.
3. The risk-free rate is 10.5 percent per annum.
4. The current interest rate on debentures is 14.5 percent per annum.
5. The current interest rate on term loans and the bank overdraft is 14 percent per annum.
6. The current interest rate on unsecured notes is 15 percent per annum.
7. The current market value of an ordinary share is $3.
8. Assume an effective corporate tax rate of 39 percent, i.e. $T = 0.39$.
9. Assume that 50 percent of the tax collected at the company level represents personal tax, i.e. 50 percent of tax credits can be utilized against personal tax liabilities so that $\gamma = 0.5$.

IMPORTANT:

ASSUME THAT THE PROFIT AND LOSS STATEMENT HAS BEEN RECONSTITUTED TO REFLECT THE COMPANY'S MAINTAINABLE OR SUSTAINABLE INCOME AND THIS IS CONSISTENT WITH DEFINITIONS OF CASH FLOW.

THE ESTIMATES ARE NOMINAL TO BE CONSISTENT WITH THE ESTIMATES OF COST OF CAPITAL.

McKelly

Equity

Ordinary Shares	40M @ $3 S = $120M under a **Classical Tax**
Cost of Capital Equity	
Ord. Shares	$E(R_e) = R_f + [E(R_m) - R_f]\beta$
	$= 10.5 + [16.5 - 10.5]1.2$
Cost of Equity	$= 17.7\%$

Value of Debt

Debentures

$$\text{Present Value} = \frac{\$9.960\text{M} \times 0.1}{0.145}\left[\frac{(1.145)^5 - 1}{(1.145)^5}\right] + \frac{\$9.960\text{M}}{(1.145)^5}$$
$$= \$8.440\text{M}$$

Term Loans

$$\text{PV} = \frac{\$15\text{M} \times 0.15}{0.14}\left[\frac{(1.14)^3 - 1}{(1.14)^3}\right] + \frac{\$115\text{M}}{(1.14)^3}$$
$$= \$5.223\text{M} + \$10.125\text{M}$$
$$= \$15.348\text{M}$$

Unsecured Notes

$$\text{PV} = \frac{\$5\text{M} \times 0.17}{0.15}\left[\frac{(1.15)^2 - 1}{(1.15)^2}\right] + \frac{\$5\text{M}}{(1.15)^2}$$
$$= \$1.382\text{M} + \$3.781\text{M}$$
$$= \$5.163\text{M}$$

Bank Overdraft = \$5M

Mortgage Loans

$$\text{PV} = \frac{\$2\text{M} \times 0.10/2}{1 + 0.15/2} + \frac{\$2\text{M}}{1 + 0.15/2}$$
$$= \$1.953\text{M}$$

Total Debt Value

D = \$8.440M + \$15.348M + \$5.163M + \$5M + \$1.953M = \$35.904M

Weighted Average Cost of Debt

$$r_D = \frac{0.145 \times 8.440}{35.904} + \frac{0.14 \times 15.348}{35.904} + \frac{0.15 \times 5.163}{35.904} + \frac{0.14 \times 5}{35.904} + \frac{0.15 \times 1.953}{35.904}$$
$$= 14.316\%$$

Total Value (V)

V = S + D = \$120M + \$35.904M = \$155.904M

Cost of Capital and Estimates of Value

I. Classical Tax System

(i) Before-tax

$$r_o^c = \frac{r_E}{(1-T)} \cdot \frac{S}{V} + r_d \cdot \frac{D}{V}$$
$$= \frac{17.7\%}{0.61} \times \frac{120}{155.904} + 14.316\% \times \frac{35.904}{155.904}$$
$$= 25.631\%$$

Definition of cash flow

$$X_O = \$29.960\text{M (see profit operations)}$$

$$\text{Implied Value} = \frac{X_O}{r_k} = \frac{\$39.960\text{M}}{0.25631} = 155.9\text{M}$$

(ii) After-tax

(a) $$r_i^c = r_E \cdot \frac{S}{V} + r_D \cdot (1-T) \cdot \frac{D}{V}$$
$$= 17.7\% \times \frac{120}{155.904} + 14.316\% \times 0.61 \times \frac{35.904}{155.904}$$
$$= 15.635\%$$

Definition of cash flow:

$$X_O(1-T) = \$24.375\text{M}$$

Implied Value = \$24.375M/0.15635 = \$155.904M

(b) $$r_{ii}^c = r_E \cdot \frac{S}{V} + r_D \cdot \frac{D}{V}$$
$$= 16.921\%$$

Definition of cash flow

$$X_D = \$5.140\text{M}$$
$$(X_O - X_D)(1-T) + X_D = \$26.380\text{M}$$

$$\text{Implied Value} = \$26.38\text{M}/0.16921$$
$$= \$155.9\text{M}$$

II. Imputation Tax System

Ordinary shares 40M @ \$3.959 = \$158.36M under an **Imputation Tax**

(i) Before-tax

$$
\begin{aligned}
r_O &= \frac{r_E}{1 - T(1-\gamma)} \cdot \frac{S}{V} + r_D \cdot \frac{D}{V} \\
&= \frac{17.7}{1 - 0.39(1-0.5)} \times \frac{158.361}{194.265} + 14.316\% \times \frac{35.904}{194.265} \\
&= 20.570\%
\end{aligned}
$$

Definition of before tax cash flows

$$X_o = \$39.960M$$

Implied Value = \$39.960M/0.20570
= \$194.265M

(ii) After-tax

I.
$$
\begin{aligned}
r_i &= r_E \cdot \frac{S}{V} \cdot \frac{(1-T)}{(1 - T(1-\gamma))} + r_D \cdot \frac{D}{V}(1-T) \\
&= 17.7\% \times \frac{158.361}{194.265} \times \frac{(1-0.39)}{(1 - 0.39(1-0.5))} + 14.316 \times \frac{35.904}{194.265} \times (1-0.39) \\
&= 10.934\% + 1.614\% \\
&= 12.548\%
\end{aligned}
$$

Definition of after-tax cash flows

$$
\begin{aligned}
X_o(1-T) &= \$39.960M \times 0.61 \\
&= \$24.376M
\end{aligned}
$$

Implied Value = \$24.376M/0.12548
= \$194.265M

II.
$$
\begin{aligned}
r_{ii} &= r_E \cdot \frac{S}{V} + r_D \cdot (1 - T(1-\gamma)) \cdot \frac{D}{V} \\
&= 17.7\% \times 0.8152 + 14.316\%(1 - 0.39(1-0.5))(1-0.8152) \\
&= 16.559\%
\end{aligned}
$$

Definition of after-tax cash flows

$$X_O(1 - T(1-\gamma)) = \$32.167M$$

Implied Value = \$32.167M/0.16559
= 194.265M

III. $r_{iii} = r_E \cdot \frac{S}{V} + r_D \cdot \frac{D}{V}$
$= 17.075\%$

Definition of cash flows

$(X_O - X_D)(1 - T(1 - \gamma)) + X_D = \$33.170M$

Implied Value = \$33.17M/0.17075
= \$194.265M

IV. $r_{iv} = r_E \cdot \frac{S}{V} + r_D \cdot (1 - T) \cdot \frac{D}{V}$
$= 16.043\%$

Definition of cash flows

$X_O(1 - T) + \gamma \cdot T \cdot (X_O - X_D) = \$31.165M$

Implied Value = \$31.165M/0.16043
= \$194.265M

REFERENCES

Ashton, D.J. (1989), "The Cost of Capital and The Imputation Tax System", *Journal of Business Finance and Accounting*, pp. 75–88.

Hathaway, N.J. and Officer, R.R. (1992) "The Value of Imputation Tax Credits", unpublished manuscript.

Officer, R.R. (1981), "Measurement of a Firm's Cost of Capital", *Accounting and Finance*, pp. 31–61.

Officer, R.R. (1988), "A Note on the Cost of Capital and Investment Evaluation For Companies Under the Imputation Tax", *Accounting and Finance*, pp. 65–71.

Officer, R.R. (1990) "The Australian Imputation System For Company Tax and its Likely Effect on Shareholders, Financing and Investment", *Australian Tax Forum*, pp. 353–375.