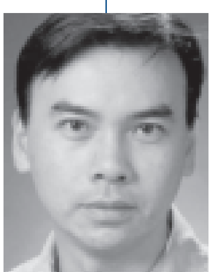
Valuation bias in projects with tax losses

Tax losses on projects often decide their viability in the initial stages. There are a number of accepted methods to measure these tax losses but **JOE CHEUNG** and **ALASTAIR MARSDEN** say care must be taken with the methods used.

JOE CHEUNG and ALASTAIR MARSDEN PhD
Department of Accounting & Finance
The University of Auckland



There are many types of investment projects that have zero expected tax liability in some future years. Examples include projects in power generation, infrastructure (e.g. toll roads), forestry and new product development. These projects often have negative expected initial cash flows and hence a zero tax liability in early years.

Even for projects that have positive expected initial cash flows, tax liability can be zero in early years due to high depreciation charges if these projects are capital intensive and have high outlays. For simplicity, we refer to these projects as 'tax-loss' projects.

An investment project is usually valued under the standard discounted cash flow approach—future cash flows are discounted using the after-tax weighted average cost of capital (WACC). This standard approach is likely to overvalue a tax-loss project. This is because the standard approach implicitly assumes a tax advantage to the use of debt that is absent in years when there is zero tax liability.

We provide an alternative valuation equation that properly accounts for the tax advantage from the use of debt and then compare this alternative valuation equation to the equation using the common definition of WACC. For projects with no expected tax losses we show that the two valuation equations are equivalent. However, for tax-loss projects, valuation biases may arise under the standard approach, and these biases are examined.

Valuation Equation

The following notations apply:

E_i where i = 0 or 1
Value of equity in period i.

D_i where i = 0 or 1
Value of debt in period i.

$V_i = E_i + D_i$ where i = 0 or 1
Value of project in period i.

k_e
Cost of equity.

k_d
Cost of debt.

t_c
Statutory corporate tax rate.

$k_d \times D_i$
Interest expense in period $i + 1$.

EBIT
Earnings before interest and tax for the period.

OCF
Other adjustments to derive cash flows to be discounted at the cost of capital (e.g. depreciation, capital expenditure, investment in new assets, working capital etc).

To recognise the impact of the dividend imputation tax system on capital budgeting decisions for Australian firms, we define the value of personal tax credits as (see Officer, 1994):
γ: the proportion of company tax paid that is rebated or credited against the investor's personal tax liability.

This means the effective corporate tax rate under imputation is $t_c(1-\gamma)$. We also define the total "effective" amount of corporate tax paid as:
Tax: amount of actual corporate tax paid that is not rebated against personal tax (either zero or tax on net profit after interest, any tax losses

carried forward and net of personal tax credits) for the period.

The value of equity at time 0 can be written as the discounted value of the expected net cash flow to equity holders at the end of period 1[1]:

(1)

$$E_0 = \frac{EBIT - k_d \text{ x } D_0 - Tax + OCF + D_1 - D_0 + E_1}{1 + k_e}$$

The net cash flow at the end of period 1 is calculated as earnings after deductions of interest and actual corporate tax paid ($EBIT - k_d \text{ x } D_0 - Tax$), adjusting for other cash flow items (OCF), change in debt[1] $D_1 - D_0$, and adding the end-of-period value of equity (E_1). The net cash flow is then discounted at the cost of equity (k_e).

The value of the equity in the project or firm can be derived from Equation 1 by multiplying each side by $(1+k_e)$ and moving interest ($k_d \text{ x } D_0$) and initial debt (D_0) to the left hand side:

$$V_0 + k_e \text{x} E_0 + k_d \text{ x } D_0 = EBIT - Tax + OCF + V_1$$

Note that terms involving $(E_i + D_i)$ are expressed as V_i ($i = 0, 1$).

Factoring V_0 on the left-hand side and rearranging:

(2)

$$V_0 = \frac{EBIT - Tax + OCF + V_1}{1 + k_e \text{ x } \frac{E_0}{V_0} + k_d \text{ x } \frac{D_0}{V_0}}$$

The key feature of Equation 2 is the discount rate in the denominator. It is similar to the standard weighted average cost of capital except that the cost of debt (k_d) is not adjusted for the tax effect $(1 - t_c(1 - \gamma))$[2]. Instead, the tax effect is accounted for directly in the numerator via the amount of corporate tax paid. In other words, Equation 2 does not implicitly assume any tax benefits of debt (i.e. if $\gamma < 1$) in periods when the tax payment is zero.

Comparison with the standard valuation equation

The standard valuation equation for an investment project follows:

(3)

$$V_0 = \frac{EBIT \text{ x } (1 - t_c(1-\gamma)) + OCF + V_1}{1 + k_e \text{ x } \frac{E_0}{V_0} + k_d \text{ x } [1 - t_c(1-\gamma)] \text{ x } \frac{D_0}{V_0}}$$

Equation 3 simply states that the current value of an investment project is the discounted value of the project's net cash flow at period end, using the standard weighted average cost of capital ($WACC$) as the discount rate (except that under dividend imputation the effective corporate tax rate is $t_c(1 - \gamma)$ as opposed to the statutory corporate tax rate of t_c.

This will be referred to as the standard *WACC* valuation equation in this article. This 'definition' of *WACC* can be found in most standard finance textbooks, (e.g. Brealey and Myers (1996, Chapter 19), Copeland and Weston (1988, Chapter 13).

Multiplying across Equation 3 by the denominator, expanding and rearranging terms:

(4)

$$V_0 = \frac{EBIT - (EBIT - k_d \text{ x } D_0) \text{ x } t_c(1-\gamma) + OCF + V_1}{1 + k_e \text{ x } \frac{E_0}{V_0} + k_d \text{ x } \frac{D_0}{V_0}}$$

Comparing Equations 2 and 4, it is clear that the two approaches produce the same project value (V_0) if:

(5)

$$Tax = (EBIT - k_d \text{ x } D_0) \text{ x } t_c(1-\gamma)$$

Condition 5 states that if the actual corporate tax paid in any given period is equal to the tax on earnings after interest, our valuation equation gives the same project value as the standard WACC valuation equation.

However, if there are periods with tax losses when the amount of tax paid is zero, Condition 5 no longer holds. Equation 2 should theoretically be used to value the investment project. In that case, Equation 3, or Equation 4, which is algebraically 'equivalent', may overstate the tax advantage in periods when in fact tax losses cannot be utilised. In other words, the standard WACC equation implicitly recognises a tax rebate in a tax-loss period even though the tax loss is to be carried forward.

Estimates of valuation biases

The magnitude of the valuation bias discussed previously will depend on a number of characteristics of any tax-loss project. Generally speaking, for a typical tax-loss project with initial tax losses that reduce over time, the key determinants of the bias will be the size of early losses, the effective corporate tax rate and the time it takes to fully utilise accumulated tax losses that can be carried forward.[3]

The following hypothetical example is constructed to illustrate the magnitude of the valuation bias for different tax-loss profiles. A set of projected financial statements over a 10-year period is constructed, from which net cash flows for the same 10-year period are derived. We assume an effective corporate tax rate of 22.5%. This is based on a statutory corporate tax rate of 30% and $\gamma = 0.25$ (assuming 50% distribution of available franking credits and a utilisation rate also of 50%).[4]

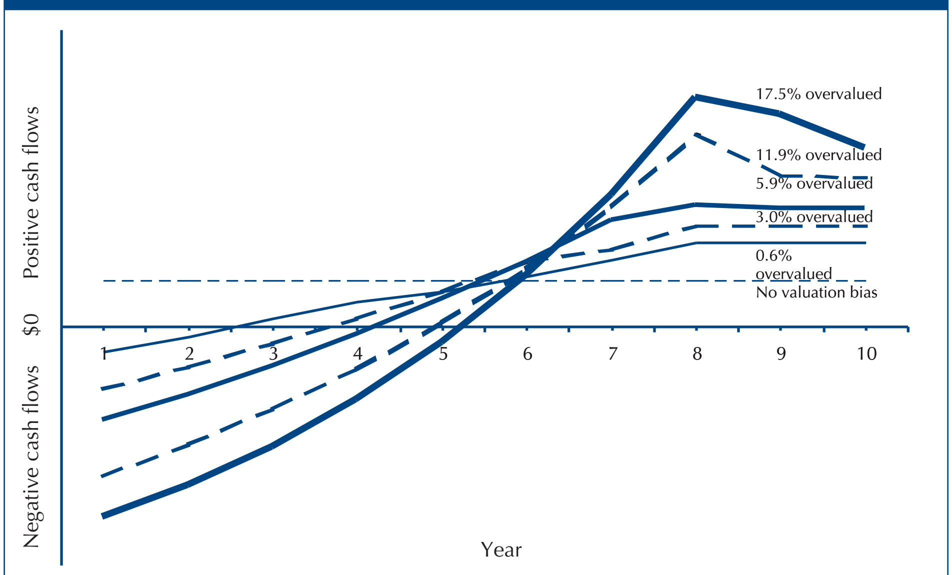
We start with a flat sales profile that generates no tax losses to show that our approach and the standard WACC approach yield the same project value. The sales profile is then 'tilted' such that it starts with a lower initial sales figure that grows at a constant rate for the next 8 years and has a zero growth thereafter. Each sales profile in turn produces a particular tax-loss profile. Five of these tilted sales and tax-loss profiles are generated and examined. For ease of comparisons, the initial sales figure and the growth rate for each sales profile are chosen so that the proper valuation method (i.e. Equation 2) produces the same project value as the one under the flat initial sales profile. In other words, while we may ascribe different tax-loss profiles to the project, the project value remains the same. Therefore, given any tax-loss profile, if the standard WACC valuation equation (i.e. Equation 3) produces a different project value, the deviation can be attributed to model error, and the relative size of the error among various tax-loss profiles can be readily compared.

The Appendix provides an example of our valuation exercise, together with the financial statements and valuation results under the 10% sales growth profile.

TABLE 1 **SUMMARY OF VALUATION BIASES UNDER DIFFERENT TAX-LOSS PROFILES**

Sales growth rate % p.a.	0%	5%	7.5%	10%	15%	20%
Initial sales	$7,000	5,531	$4,919	$4,376	$3,460	$2,738
Standard WACC valuation Equation (3)	$5,182	$5,196	$5,247	$5,312	$5,441	$5,563
Less value of debt	-$3,000	-$3,000	-$3,000	-$3,000	-$3,000	-$3,000
Value of equity – Equation (3)	**$2,182**	**$2,196**	**$2,247**	**$2,312**	**$2,441**	**$2,563**
Correct project value – Equation (2)	$5,182	$5,182	$5,182	$5,182	$5,182	$5,182
Less value of debt	-$3,000	-$3,000	-$3,000	-$3,000	-$3,000	-$3,000
Value of equity – Equation (2)	**$2,182**	**$2,182**	**$2,182**	**$2,182**	**$2,182**	**$2,182**
Amount of overvaluation of equity	$0	$13	$65	$129	$259	$381
Percent overvalued	0.0%	0.6%	3.0%	5.9%	11.9%	17.5%
Time until accumulated tax losses are fully utilised	no tax loss years	5 years	7 years	8 years	9 years	9 years

FIGURE 1 **OVERVALUATION PRODUCED BY THE STANDARD WACC VALUATION EQUATION UNDER DIFFERENT CASH FLOW PROFILES**



For simplicity we assume a project with a perpetual life (no growth) from the end of year eight onwards. We further assume there are corporate but no personal taxes and all debt tax shields are uncertain. We value the project using the standard capital asset pricing model and beta-degearing formula to determine the cost of equity capital as set out in Taggart (1991), Exhibit 2, panel C.

Table 1 contains a summary of the valuation bias under different assumed sales profiles. In general, the 'steeper' the sales profile (as represented by a high growth rate in our example), the greater the tax losses in early years of the project and the longer it will take for the accumulated tax losses to be utilised.

Our discussion above suggest that the standard WACC valuation equation will also produce a larger overvaluation bias under a steeper profile. This can be easily verified from the results in the 'Percent Overvalued' row in Table 1. With no tax losses, Equation 2 and Equation 3 give the same valuation. However, if the project has expected initial tax losses that are not fully utilised until the end of 9 years, then the percent overvaluation under the standard textbook equation (Equation 3) is between 11.9% and 17.5%.

Figure 1 provides a visual representation of the same results. Cash flow profiles instead of sales profiles from our hypothetical project are plotted in Figure 1 to provide a better

Continued on page 18

The best

qualifications in Financial Planning.

In the Financial Planning industry, careers are built on qualifications. And the Securities Institute's Financial Planning courses are the best industry qualifications available. For the last 37 years we have led the way in financial services education, and our courses meet both the expectations of top employers and the requirements set by ASIC.

Acquire the skills you need with these four ASIC compliant courses: **Diploma of Financial Services (Financial Planning), Advanced Diploma of Financial Services (Financial Planning), Graduate Certificate in Financial Planning** and **Graduate Diploma in Financial Planning**. Each course offers lectures from expert practitioners, using real life examples from your industry.

If you already have a degree, remember that we're the leader in postgraduate Financial Planning courses. Plus you can choose from a range of options, when and how you want to study – by distance education, summer school, workshops or lectures.

So if you're looking for Financial Planning qualifications that will make top employers look for you, start with the Securities Institute.

"Your choice to study at the Securities Institute today is an important one. The Australian finance and investment industry is a dynamic and challenging place to be. Whatever your skills, if you have the dedication and desire to succeed, there is a position for you."

Allan Moss FSIA
Managing Director,
Macquarie Bank Limited

Call us now to talk about enrolment.

1300 880 121

SECURITIES INSTITUTE

www.securities.edu.au

SECURE YOUR FUTURE

indication of the tax position.

Again, it is clear that the steeper the cash flow profile, the larger the early tax losses and the larger the valuation bias. We believe that cash flow profiles such as those in Figure 1, especially for start-up projects, are by no means atypical.

CONCLUSION

Financial analysts have a toolbox replete with standard finance formulae. It is tempting to use these standard formulae without modifications. Actual applications, however, often involve situations different from those assumed in the derivation of these formulae. Applying standard formulae without modifications could in some cases lead to significant errors.

In this article, we have provided such an example. When the standard WACC valuation equation is used to value a project that has expected tax losses, it is likely to overvalue the project since the equation implicitly values a tax shield even when none exists. We have provided an alternative equation that explicitly values tax shields only when they are utilised. Potential valuation biases are illustrated in a hypothetical valuation exercise. For projects with expected initial tax losses, analysts should approach these projects with caution when using standard textbook formulae.

REFERENCES

Brealey R.A. and Myers,S.C. 1996, Principles of corporate finance, 5th edition (International), McGraw-Hill Company.

Copeland, T.E. and Weston, J.F., 1998, Financial theory and corporate policy, 3rd edition, Addison-Wesley Publishing Company Inc.

Gray, S. 1999, Response to consultation paper No 4: cost of capital financing: Submitted to the Office of the Regulator General Victoria as part of the 2001 Electricity Distribution Price Review, http://www.reggen.vic.gov.au/docs/lectric/ConsPap4Resp/graycon4.pdf

Officer, R.R. 1994, The cost of capital under an imputation tax system, *Accounting and Finance* 34, 1, 1-19.

Taggart, R.A., 1991, Consistent valuation and cost of capital expressions with corporate and personal taxes, Financial Management Association, Autumn, 8-20.

Walker, S. and Partington, G., 1999, The value of dividends: Evidence from cum dividend trading in the ex-dividend period, *Accounting and Finance*, 39, 275-96.

Welch, I., 2000, Views of financial economists on the equity risk premium and on professional controversies, *Journal of Business*, 73, 4, 501-37.

APPENDIX (see Table 2 following)

This Appendix provides an example of our valuation exercise, together with the financial statements and valuation results under the 10% sales growth profile. For simplicity we assume a project with a perpetual life and no growth from year 9 onwards. We further assume there are corporate but no personal taxes and all debt tax shields are uncertain. We value the project using the standard capital asset pricing model and beta-degearing formula as set out in Taggart (1991), Exhibit 2, panel C, with the following additional assumptions. That is:

$$k_e = r_f + \beta_L \text{ x } (R_m - r_f)$$

where:

r_f = risk-free rate = 6%

$R_m - r_f$ = market risk premium[5] = 7%

β_L = levered beta = $\beta_U \text{ x } (1+\frac{D}{E})$

β_U = unlevered beta = 0.75

D/E = ratio of market value of debt to equity

The project assumes a constant level of debt (equal to $3000), no change in working capital and depreciation exactly offset by new capital expenditure. The effective corporate tax rate is 22.5%. As noted on page 15 of this paper, this is based on a statutory tax rate of 30% and γ = 0.25 (assuming 50% distribution of available credits and a utilisation rate also of 50%). Any tax losses must be carried forward and can only be utilised when the project has sufficient taxable income to offset the losses. For simplicity we also assume the cost of debt is equal to the risk-free rate of 6%.

The terminal value at year 10 is calculated as Free cashflows/WACC (i.e. $10,441 = $1,175 / 11.25% if using Equation (2) or $1,134/10.86 % if using Equation (3)). The values in prior periods (i.e. years 0 to 9) are then derived working backwards. Line 48 provides the value of the project equity using Equation (2). Line 61 provides the value of the project equity using Equation (3). The tax calculation taking into account carry forward losses are found in lines 28 to 32. We iterate both Equations (2) and (3) as the ratio of D/E changes on a period-by-period basis under the assumption of a constant absolute level of debt in perpetuity.

NOTES

1 For instance, assuming zero net capital injection, shareholders can increase debt to replace equity, or increase equity to retire debt. D_1–D_0 will allow for these changes.

2 Our equation (2) is equivalent to Officer's (1994) equations (11) and (12). Unlike Officer, however, our derivation does not assume perpetual cashflows.

3 Our examples assume any initial tax losses can be carried forward and used to offset the tax liability against future taxable income.

4 The value of imputation credits is currently subject to much debate in the academic literature. For instance, Walker and Partington (1999) estimate the value of distributed imputation credits to be close to 90% of face value based on contemporaneous cum and ex-dividend share trades. On the other hand Gray (1999) argues that for firms with a significant number of offshore shareholders, the value of imputation credits is zero.

5 Welch (2000) reports average arithmetic equity risk premium consensus forecasts in the range of 6% to 7%.

6 For instance, assuming zero net capital injection, shareholders can increase debt to replace equity, or increase equity to retire debt. D_1–D_0 will allow for these changes. J

TABLE 2 **TAX-LOSS PROJECT VALUATION EXERCISE**

	0	1	2	3	4	5	6	7	8	9	10
Balance Sheet											
1 Cash	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100	$100
2 Receivables	$900	$900	$900	$900	$900	$900	$900	$900	$900	$900	$900
3 Stocks	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200	$200
4 Gross Fixed Assets	$1,500	$1,800	$2,100	$2,400	$2,700	$3,000	$3,300	$3,600	$3,900	$4,200	$4,500
5 Accum depreciation	$ –	$300	$600	$900	$1,200	$1,500	$1,800	$2,100	$2,400	$2,700	$3,000
6 Net Fixed Assets	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500	$1,500
7 TOTAL ASSETS	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700
8 Acc. Payable	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500	$500
9 Debt–market value	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
10 Net worth (book value)	–$800	–$800	–$800	–$800	–$800	–$800	–$800	-$800	–$800	–$800	–$800
11 TOTAL LIAB & NW	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700	$2,700
Working capital assumption											
12 Working capital requirements	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700	$700
13 Change WCR	–	–	–	–	–	–	–	–	–	–	–
Profit & Loss											
14 Sales	–	$4,376	$4,813	$5,294	$5,824	$6,406	$7,047	$7,751	$8,527	$8,527	$8,527
15 Cost of sales (50% of sales)	–	$2,188	$2,407	$2,647	$2,912	$3,203	$3,523	3,876	$4,263	$4,263	$4,263
16 General fixed costs	–	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500
17 Depreciation	–	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
18 EBIT	–	–$612	–$393	–$153	$112	$403	$723	$1,076	$1,463	$1,463	$1,463
19 Interest	–	$180	$180	$180	$180	$180	$180	$180	$180	$180	$180
20 Profit before tax	–	–$792	–$573	–$333	–$68	$223	$543	$896	$1,283	$1,283	$1,283
21 Less actual tax (22.5% if no tax loss c/f)	–	–	–	–	–	–	–	–	–$265	–$289	–$289
22 Profit after taxes (PAT)	–	–$792	–$573	–$333	–$68	$223	$543	$896	$1,018	$995	$995
23 + Depreciation	–	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
24 + change debt	–	–	–	–	–	–	–	–	–	–	–
25 – change WCR	–	–	–	–	–	–	–	–	–	–	–
26 – payments fixed assets	–	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300
27 Cash Flow to share or equityholders	–	–$792	–$573	–$333	–$68	$223	$543	$896	$1,018	$995	$995
Tax calculation											
28 Profit before tax	–	–$792	–$573	–$333	-$68	$223	$543	$896	$1,283	$1,283	$1,283
29 Less loss carried forward	–	–	–$792	–$1,366	–$1,699	–$1,767	–$1,544	–$1,000	–$104	$	- $ -
30 Taxable profit	–	–$792	–$1,366	–$1,699	–$1,767	–$1,544	–$1,000	–$104	$1,179	$1,283	$1,283
31 Tax	–	–	–	–	–	–	–	–	–$265	–$289	-$289
32 Loss carried forward	–	–$792	-$1,366	–$1,699	–$1,767	–$1,544	–$1,000	–$104	–	–	–

TABLE 2 **TAX-LOSS PROJECT VALUATION EXERCISE (CONT)**

Calculation of free cash flows using actual tax	0	1	2	3	4	5	6	7	8	9	10
33 EBIT	–	–$612	–$393	–$153	$112	$403	$723	$1,076	$1,463	$1,463	$1,463
34 Less actual tax (22.5% if no tax loss c/f)	–	–	–	–	–	–	–	–	–$265	–$289	–$289
35 +Depreciation	–	$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
38 - payments fixed assets	–	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300
39 Free cash flows - using actual tax	–	–$612	–$393	–$153	$112	$403	$723	$1,076	$1,198	$1,175	$1,175
Calculation of cost of capital (r_f = 6%, $R_m - r_f$ = 7%)											
40 Beta unlevered	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
43 Beta levered	1.7811	1.4162	1.2513	1.1603	1.1057	1.0727	1.0553	1.0515	1.0524	1.0524	1.0524
44 Cost of levered equity	18.47%	15.91%	14.76%	14.12%	13.74%	13.51%	13.39%	13.36%	13.37%	13.37%	13.37%
45 WACC = k_e x E/V + k_b x D/V	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%	11.25%
46 D + E = NPV (WACC:FCF)	***$5,182***	***$6,377***	***$7,488***	***$8,484***	***$9,326***	***$9,972***	***$10,371***	***$10,462***	***$10,441***	***$10,441***	***$10,441***
47 DEBT (D)	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
48 EQUITY (E)	$2,182	$3,377	$4,488	$5,484	$6,326	$6,972	$7,371	$7,462	$7,441	$7,441	$7,441
Calculation of valuation error using EBIT(1– t_c(1- γ))											
49 EBIT		–$612	–$393	–$153	$112	$403	$723	$1,076	$1,463	$1,463	$1,463
50 Less tax @22.5%		$138	$89	$34	–$25	–$91	–$163	–$242	–$329	–$329	–$329
51 + Depreciation		$300	$300	$300	$300	$300	$300	$300	$300	$300	$300
54 – payments fixed assets		–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300	–$300
55 Free cash flows - using t_c(1-γ)		–$474	–$305	–$118	$87	$312	$561	$834	$1,134	$1,134	$1,134
56 Beta levered	1.7234	1.4230	1.2707	1.1808	1.1237	1.0867	1.0638	1.0524	1.0524	1.0524	1.0524
57 Cost of levered equity	18.06%	15.96%	14.89%	14.27%	13.87%	13.61%	13.45%	13.37%	13.37%	13.37%	13.37%
58 WACC = k_e x E/V + k_b x (1-t_c(1-γ)) x D/V	10.49%	10.61%	10.70%	10.76%	10.80%	10.83%	10.85%	10.86%	10.86%	10.86%	10.86%
59 D + E = NPV (WACC:FCF)	***$5,312***	***$6,343***	***$7,321***	***$8,223***	***$9,020***	***$9,682***	***$10,171***	***$10,441***	***$10,441***	***$10,441***	***$10,441***
60 DEBT (D)	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000	$3,000
61 EQUITY (E)	$2,312	$3,343	$4,321	$5,223	$6,020	$6,682	$7,171	$7,441	$7,441	$7,441	$7,441
62 Difference in equity value	***$129***	***–$ 34***	***–$167***	***–$261***	***–$306***	***–$290***	***–$200***	***–$21***	–	–	–
63 Percent Error	***5.93%***	***–1.02%***	***–3.73%***	***–4.76%***	***–4.83%***	***–4.16%***	***–2.72%***	***–0.28%***	***0.00%***	***0.00%***	***0.00%***

1 Our examples assume any initial tax losses can be carried forward and used to offset the tax liability against future taxable income.

2 The value of imputation credits is currently subject to much debate in the academic literature. For instance, Walker and Partington (1999) estimate the value of distributed imputation credits to be close to 90% of face value based on contemporaneous cum and ex-dividend share trades. On the other hand Gray (1999) argues that for firms with a significant number of offshore shareholders, the value of imputation credits is zero.