FINANCE VAN DER WIJST

Chapter 6: Valuing levered projects

Exercises - solutions

1. (a) To calculate the WACC we need the value of each capital category and its required return. The value of the common shares is $10 \times 6 = 60$ million @ 12%; the value of the preferred shares is $1 \times 5 = 5$ million @ 15%. The value of the zero coupon bonds is $4 \times 6.806 = 27.224$. Their required return can be calculated from the face value, to be paid when the bond matures: $6.806 = 10/(1+r)^5$ solving for r gives 1.08 or 8%. The values and interest rates of the bank loans are given. Accounts payable do not bear interest, they can be netted out against current assets to give net working capital. Total equity and liabilities is thus $60 + 5 + 27.224 + 20 + 20 = 132.22$. The WACC then is:

$$\frac{60}{132.22} \times 0.12 + \frac{5}{132.22} \times 0.15 + (1 - 0.25) \times \frac{27.224}{132.22} \times 0.08 + ..$$
$$.. + (1 - 0.25) \times \frac{20}{132.22} \times 0.07 + (1 - 0.25) \times \frac{20}{132.22} \times 0.09 = 0.091$$

2. (a) No! If the proportion of debt doubles the interest rate will not remain the same, nor will the required return on equity.

3. (a) With continuous rebalancing taxes drop from equation and $r_a = r_e \frac{E}{V} + r_d \frac{D}{V}$ so for the 4 firms:

$$\begin{aligned}
.16 \times .4 + .052 \times .6 &= 0.0952 \\
.145 \times .5 + .049 \times .5 &= 0.097 \\
.136 \times .5 + .046 \times .5 &= 0.091 \\
.124 \times .6 + .043 \times .4 &= 0.0916
\end{aligned}$$

The average of the 4 rates is $(.0952 + .097 + .091 + .0916)/4 = 0.0937$ or 9.4%.

4. (a) Calculations are shown in the table below:

year	Loan at year end	Interest $r_d D$	tax saving $\tau r_d D$	PV(tax saving)
1	400 000	40 000	12 000	12 000/1.1=10 909
2	300 000	30 000	9 000	9 000/1.1^2= 7 438
3	200 000	20 000	6 000	6 000/1.1^3= 4 508
4	100 000	10 000	3 000	3 000/1.1^4= 2 049
sum				24 904

(b) No, the point is not that the tax savings are stable, but that they are predetermined, i.e. their size does not depend on uncertain future developments. The tax settlement is already known, not uncertain.

5. (a) To calculate APV we start with the base case, the value of the project as if it were all equity financed. The OCC is given as 12.5% so the NPV of the cash flows is:

$-1000 + \frac{333}{1.125} + \frac{333}{1.125^2} + \frac{333}{1.125^3} + \frac{333}{1.125^4} = 0.88$. The project has 2 side effects, issue costs and tax shields.

To raise 500, the company will have to issue $\frac{100}{95} \times 500 = 526.32$ so the issue costs are $526.32 - 500 = 26.32$

The amount of debt will be available throughout the project's life so the yearly interest payments are $.08 \times 500 = 40$. This gives a tax advantage of $.3 \times 40 = 12$. Since debt is predetermined, the discount rate for the tax advantage is the cost of debt. The PV is $\frac{12}{1.08} + \frac{12}{1.08^2} + \frac{12}{1.08^3} + \frac{12}{1.08^4} = 39.75$.

The project's APV is $0.88 - 26.32 + 39.75 = 14.31 > 0$, E-razor should go ahead with the project.

(b) APV is the preferred method in this case because it involves issue costs that cannot be included in the discount rate. Moreover, because debt is predetermined and fixed, the D/E ratio will be different in each of the project's 4 years and, hence, the cost of equity, r_e, and the WACC will be different too.

6. Korkla should accept the project if it has a positive NPV; to calculate NPV we need the cash flow and investment (both given) and the proper discount rate. The discount rate is determined by the characteristics of the project; the background data on Korkla are irrelevant. The business risk and the corresponding opportunity cost of capital can be calculated from Checkers' data, since this is the only company active in the NO-WITS industry. We proceed as follows:

(I) First we calculate the return on assets, or the opportunity cost of capital (OCC), r_a, for Checkers. For this we need the return on equity, r_e, which we can find with the CAPM: $r_e = r_f + \beta_e(r_m - r_f) = .06 + 1.4 \times .08 = .172$

Return on assets can be found in three ways:

i. By using the formula for r_e in reverse:
$r_e = r_a + (r_a - r_d)D/E$
$.172 = r_a + (r_a - .09).5/.5 \Rightarrow r_a = .131$

ii. Alternatively, using unlevering:
$r_a = .5 \times .09 + .5 \times .172 = .131$.

iii. Finally, it is also possible to calculate β_d from the CAPM: $.09 = .06 + \beta_d \times .08 \Rightarrow \beta_d = .375$ and then use the β version of the formula to find β_a :
$\beta_e = \beta_a + (\beta_a - \beta_d)D/E \Rightarrow 1.4 = \beta_a + (\beta_a - .375).5/.5 \Rightarrow \beta_a = .8875$.
The CAPM then gives: $r_a = .06 + .8875 \times .08 = .131$

(II) Given the opportunity costs of capital in the NO-WITS industry and the financing characteristics for Korkla's project ($D/E = .25/.75$, $r_d = 8\%$) we can calculate the project's WACC in two ways:

i. Calculate r_e for the project: $r_e = r_a + (r_a - r_d)D/E = .131 + (.131 - .08).25/75 = .148$, which gives a project WACC of: $(.75 \times .148) + (.25 \times (1 - .4) \times .08) = .123$

ii. Alternatively, we could have used Miles-Ezzell's formula: $r' = r_a - \tau r_d L \left(\frac{1+r_a}{1+r_d}\right) = .131 - .4 \times .08 \times \frac{.25}{1} \times \frac{1.131}{1.08} = .123$

(III) With this WACC the value of the cash flow becomes: 100/.123=813 so that NPV$= 813 - 750 = 63 > 0$, $\Rightarrow$ Korkla should accept the project.

(IV) APV can also be used. We proceed as follows:

i. Discount the cash flow at the OCC: $100/.131 = 763.359$

ii. The tax advantage is $\tau r_d D = .4 \times .08 \times (.25 \times 750) = 6$

iii. Discounting this at the OCC gives $6/.131 = 45.80$

iv. Multiply by $(1 + r_a)/(1 + r_d) = 1.131/1.08 = 1.0472.. \times 45.80 = 47.96$.

v. APV is then: $763.359 + 47.96 - 750 = 61.32 > 0$, so Korkla should accept the project.