

### Chapter 12: WACC and Valuation of Business

1. The total value of the firm is €900 million. The weights for each security class are as follows:

$$\begin{aligned} \text{Debt:} & \quad D/V = 300/900 = 0.333 \\ \text{Preferred:} & \quad P/V = 100/900 = 0.111 \\ \text{Common:} & \quad E/V = 500/900 = 0.556 \end{aligned}$$

$$\begin{aligned} \text{WACC} &= \left[ \frac{D}{V} \times r_{\text{debt}} \times (1 - T_C) \right] + \left[ \frac{P}{V} \times r_{\text{preferred}} \right] + \left[ \frac{E}{V} \times r_{\text{equity}} \right] \\ &= [0.333 \times 6\% \times (1 - 0.35)] + [0.111 \times 7.5\%] + [0.556 \times 12.0\%] = 8.80\% \end{aligned}$$

$$3. \quad r = \frac{\text{DIV}_1}{P_0} + g = \frac{\text{DIV}_0(1+g)}{P_0} + g = \frac{\$5 \times 1.05}{\$60} + 0.05 = 0.1375 = 13.75\%$$

5. Free cash flow = Net income + annual depreciation expense — Capital investment

$$\begin{aligned} \text{Free cash flow (year 1)} &= (3 \times \text{£}11 \text{ million}) + (3 \times \text{£}5 \text{ million}) - \text{£}80 \text{ million} \\ &= -\text{£}32 \text{ million} \end{aligned}$$

$$\begin{aligned} \text{Free cash flow (year 2)} &= (3 \times \text{£}11 \text{ million}) + (3 \times \text{£}5 \text{ million}) - \text{£}80 \text{ million} \\ &= -\text{£}32 \text{ million} \end{aligned}$$

$$\text{Free cash flow (year 3)} = (5 \times \text{£}11 \text{ million}) + (5 \times \text{£}5 \text{ million}) = \text{£}80 \text{ million}$$

6. Executive Fruit should use the WACC of Geothermal, not its own WACC, when evaluating an investment in geothermal power production. The risk of the project determines the discount rate, and in this case, Geothermal's WACC is more reflective of the risk of the project in question. The proper discount rate, therefore, is not 12.3%. It is more likely to be 11.4%.

7. a. The weighted average cost of capital, with a tax rate of 40%, is:

$$\begin{aligned} \text{WACC} &= \left[ \frac{D}{V} \times r_{\text{debt}} \times (1 - T_c) \right] + \left[ \frac{E}{V} \times r_{\text{equity}} \right] \\ &= [0.30 \times 6\% \times (1 - 0.40)] + [0.70 \times 11\%] = 8.78\% \end{aligned}$$

Free cash flow next year is: \$68 million – \$30 million = \$38 million

Since the cash flows are in the form of a growing perpetuity, with a growth rate of 4%, the total value of Icarus is:

$$\text{PV} = \frac{\$38 \text{ million}}{r - g} = \frac{\$38 \text{ million}}{0.0878 - 0.04} = \$795 \text{ million}$$

- b. Since management will maintain the company's debt at 30% of the present value of the company, the company's equity is:

$$0.70 \times \$795 \text{ million} = \$556.5 \text{ million}$$

10. a. Using the recent growth rate of 30% and the dividend yield of 2%, one estimate would be:

$$\text{DIV}_1/P_0 + g = 0.02 + 0.30 = 0.32 = 32\%$$

Another estimate, based on the CAPM, would be:

$$r = r_f + \beta(r_m - r_f) = 4\% + (1.2 \times 8\%) = 13.6\%$$

- b. The estimate of 32% seems far less reasonable. It is based on an historic growth rate that is impossible to sustain. The  $[\text{DIV}_1/P_0 + g]$  rule requires that the growth rate of dividends per share must be viewed as highly stable over the foreseeable future. In other words, it requires the use of the sustainable growth rate.

11.

Security	Market Value	Explanation
Debt	\$ 5.5 million	1.10 × par value of \$5 million
Equity	\$15.0 million	\$30 per share × 500,000 shares *
Total	\$20.5 million	

$$\text{*Number of shares} = \frac{\$10 \text{ million book value}}{\$20 \text{ book value per share}} = 500,000$$

$$\begin{aligned} \text{WACC} &= \left[ \frac{D}{V} \times r_{\text{debt}} \times (1 - T_C) \right] + \left[ \frac{E}{V} \times r_{\text{equity}} \right] \\ &= \left[ \frac{5.5}{20.5} \times 9\% \times (1 - 0.40) \right] + \left[ \frac{15}{20.5} \times 15\% \right] = 12.42\% \end{aligned}$$

15. a. The 9% coupon bond has a yield to maturity of 10% and sells for 93.86% of face value, as shown below:

$$\text{PV} = 90 \times \left[ \frac{1}{0.10} - \frac{1}{0.10(1.10)^{10}} \right] + \frac{\$1,000}{1.10^{10}} = \$938.55$$

Using a financial calculator, enter: n = 10, i = 10%, PMT = 90, FV = 1000, compute PV = \$938.55

Therefore, the market value of the issue is:

$$0.9386 \times \$20 \text{ million} = \$18.77 \text{ million}$$

The 10% coupon bond sells for 94% of par value, and has a yield to maturity of 10.83%, as shown below:

$$\$940 = \$100 \times \left[ \frac{1}{r} - \frac{1}{r \times (1+r)^{15}} \right] + \frac{\$1,000}{(1+r)^{15}} \Rightarrow r = 10.83\%$$

Using a financial calculator, enter: n = 15, PV = (-)940, PMT = 100, FV = 1000, compute i = 10.83%

The market value of the issue is: 0.94 × \$25 million = \$23.50 million

Therefore, the weighted-average before-tax cost of debt is:

$$\left[ \frac{18.77}{18.77 + 23.50} \times 10\% \right] + \left[ \frac{23.50}{18.77 + 23.50} \times 10.83\% \right] = 10.46\%$$

- b. The after-tax cost of debt is:  $(1 - 0.35) \times 10.46\% = 6.80\%$