

Appendix D: Answers to Self-Test Problems

Chapter 2 Financial Statement and Cash Flow Analysis

ST2-1 Use the financial statements below to answer the questions about S&M Manufacturing's financial position at the end of the calendar year 2006.

S&M Manufacturing Balance sheet at 31 December 2006 (€000)

Assets		Liabilities and equity	
Current assets		Current liabilities	
Cash	€ 140 000	Accounts payable	€ 480 000
Marketable securities	260 000	Notes payable	500 000
Accounts receivable	650 000	Accruals	80 000
Inventories	800 000	Total current liabilities	<u>€1 060 000</u>
Total current assets	<u>€1 850 000</u>	Long-term debt	
Fixed assets		Bonds outstanding	€1 300 000
Gross fixed assets	<u>€3 780 000</u>	Bank debt (long-term)	260 000
Less: Accumulated depreciation	<u>1 220 000</u>	Total long-term debt	<u>€1 560 000</u>
Net fixed assets	€2 560 000	Shareholders' equity	
Total assets	€4 410 000	Preference shares	€180 000
		Par value of shares	200 000
		Paid-in capital in excess of par	810 000
		Retained earnings	<u>600 000</u>
		Total shareholders' equity	<u>€1 790 000</u>
		Total liabilities and equity	€4 410 000

S&M Manufacturing		
Income statement for year ended 31 December 2006 (€000)		
Sales revenue		€6 900 000
Less: Cost of goods sold		4 200 000
Gross profits		<u>€2 700 000</u>
Less: Operating expenses		
Sales expense	€ 750 000	
General and administrative expense	1 150 000	
Leasing expense	210 000	
Depreciation expense	<u>235 000</u>	
Total operation expenses		<u>2 345 000</u>
Earnings before interest and taxes		€ 355 000
Less: Interest expense		85 000
Net profit before taxes		<u>€ 270 000</u>
Less: Taxes		81 000
Net profits after taxes		€ 189 000
Less: Preference shares dividends		10 800
Earnings available for ordinary shareholders		€ 178 200
Less: Dividends		75 000
To retained earnings		<u>€ 103 200</u>
Per share data		
Earnings per share (EPS)	€ 1.43	
Dividends per share (DPS)	€ 0.60	
Price per share	€ 15.85	

- a How much cash and near cash does S&M have at year-end 2006?
- b What was the original cost of all of the firm's real property that is currently owned?
- c How much in total liabilities did the firms have at year-end 2006?
- d How much did S&M owe for credit purchases at year-end 2006?
- e How much did the firm sell during 2006?
- f How much equity did the common stockholders have in the firm at year-end 2006?
- g What was the cumulative total of earnings reinvested in the firm from its inception through to the end of 2006?
- h How much operating profit did the firm earn during 2006?
- i What was the total amount of dividends paid out by the firm during the year 2006?
- j How many shares did S&M have outstanding at year-end 2006?

Answer ST2-1

- a €400 000 (only cash and marketable securities should be included
€140 000 + €260 000)
- b €3 780 000 (net asset position + depreciation)
- c €2 620 000 (current liabilities + long-term debt)
- d €480 000 (accounts payable)
- e €6 900 000 (sales)

- f €1 010 000 (ordinary shares at par + paid-in capital)
 g €600 000 (retained earnings)
 h €355 000 (EBIT)
 i €85 800 (preference + ordinary share dividends)
 j 124 615 shares outstanding (178 200/1.43)

ST2-2 The partially complete 2006 balance sheet and income statement for Challenge Industries are set out below, followed by selected ratio values for the firm based on its completed 2006 financial statements. Use the ratios along with the partial statements to complete the financial statements.

Hint: Use the ratios in the order listed to calculate the missing statement values that need to be installed in the partial statements.

Challenge Industries			
Balance sheet at 31 December 2006 (in €000)			
Assets		Liabilities and equity	
Current assets		Current liabilities	
Cash	€ 52 000	Accounts payable	€150 000
Marketable securities	60 000	Notes payable	?
Accounts receivable	200 000	Accruals	80 000
Inventories	?	Total current liabilities	?
Total current assets	?	Long-term debt	€425 000
Fixed assets (gross)	?	Total liabilities	?
Less: Accumulated depreciation	240 000	Shareholders' equity	
Net fixed assets	?	Preference shares	?
Total assets	?	Par value of shares	150 000
		Paid-in capital in excess of par	?
		Retained earnings	390 000
		Total shareholders' equity	?
		Total liabilities and shareholders' equity	?

Challenge Industries			
Income statement for the year ended 31 December 2006 (in €000)			
Sales revenue			€4 800 000
Less: Cost of goods sold			?
Gross profits			?
Less: Operating expenses			
Sales expense	€690 000		
General and administrative expense	750 000		
Depreciation expense	120 000		
Total operating expenses			1 560 000
Earnings before interest and taxes			?
Less: Interest expense			35 000
Earnings before taxes			?
Less: Taxes			?
Net income (Net profits after taxes)			?
Less: Preference dividends			15 000
Earnings available for ordinary shareholders			?
Less: Dividends			60 000
To retained earnings			?

Challenge Industries
Ratios for the year ended 31 December 2006

Ratio	Value
Total asset turnover	2.00
Gross profit margin	40%
Inventory turnover	10
Current ratio	1.60
Net profit margin	3.75%
Return on equity	12.5%

Answer ST2-2

Challenge Industries
Balance sheet at 31 December 2006 (in €000)

Assets		Liabilities and equity	
Current assets		Current liabilities	
Cash	52 000	Accounts payable	150 000
Marketable securities	60 000	Notes payable	145 000
Accounts receivable	200 000	Accruals	80 000
Inventory	<u>288 000</u>	Total current liabilities	<u>375 000</u>
Total current assets	<u>600 000</u>	Long-term debt	<u>425 000</u>
Fixed assets (gross)	2 040 000	Total liabilities	<u>800 000</u>
Less: Accumulated depreciation	<u>240 000</u>	Shareholders' equity	
Net fixed assets	1 800 000	Preference shares	160 000
Total assets	<u>2 400 000</u>	Ordinary shares (at par)	150 000
		Paid-in capital in excess of par	900 000
		Retained earnings	<u>390 000</u>
		Total shareholders' equity	<u>1 600 000</u>
		Total liabilities and shareholders' equity	<u>2 400 000</u>

Challenge Industries
Income statement for the year ended 31 December 2006 (in €000)

Sales revenue	4 800 000
Less: Cost of goods sold	<u>2 880 000</u>
Gross profits	1 920 000
Less Operating expenses	
Selling expense	690 000
General and administrative expense	150 000
Depreciation	<u>120 000</u>
Total operation expenses	<u>1 560 000</u>
Earnings before interest and taxes	360 000
Less: Interest expense	<u>35 000</u>
Earnings before taxes	325 000
Less: Taxes	<u>130 000</u>
Net income (Net profits after taxes)	195 000
Less: Preference dividends	<u>15 000</u>
Earnings available for ordinary shareholders	180 000
Less: Dividends	<u>60 000</u>
To retained earnings	<u>120 000</u>

Chapter 3 Present Value

ST3-1 Starratt Alexander is considering investing specified amounts in each of four investment opportunities described below. For each opportunity, determine the amount of money Starratt will have at the end of the given investment horizon.

Investment A: Invest a lump sum of €2750 today in an account that pays 6 per cent annual interest and leave the funds on deposit for exactly 15 years.

Investment B: Invest the following amounts at the beginning of each of the next five years in a venture that will earn 9 per cent annually and measure the accumulated value at the end of exactly five years:

BEGINNING OF YEAR	AMOUNT
1	€ 900
2	1000
3	1200
4	1500
5	1800

Investment C: Invest €1200 at the end of each year for the next ten years in an account that pays 10 per cent annual interest and determine the account balance at the end of year 10.

Investment D: Make the same investment as in investment C but place the €1200 in the account at the beginning of each year.

Answer ST3-1

Investment A: Future value is €6590 = (€2750 × FV(15, 6%) = 2.3966)

Investment B: Future value = €900 × (1.09)⁵ + €1000 × (1.09)⁴ + €1200 × (1.09)³ + €1500 × (1.09)² + €1800 × (1.09) = €8094.53

Investment C: Future value is €19116 (€1200 × FVAF(10, 10%) = 15.93)

Investment D: €19116 × 1.09 = €20836

ST3-2 Gregg Snead has been offered four investment opportunities, all equally priced at €45 000. Because the opportunities differ in risk, Gregg's required returns (i.e. applicable discount rates) are not the same for each opportunity. The cash flows and required returns for each opportunity are summarized below.

OPPORTUNITY	CASH FLOWS	REQUIRED RETURN
A	€7500 at the end of 5 years	12%
B	Year	Amount
	1	€10 000
	2	12 000
	3	18 000
	4	10 000
	5	13 000
	6	9 000
C	€5000 at the end of each year for the next 30 years.	10%
D	€7000 at the beginning of each year for the next 20 years.	18%

- a Find the present value of each of the four investment opportunities.
- b Which, if any, opportunities are acceptable?
- c Which opportunity should Gregg take?

Answer ST3-2

- a PV of A: $€7500 \times PV(5, 12\%) = 0.5674 = €4255.50$
 PV of B: $€10\,000/(1.15) + €12\,000/(1.15)^2 + €18\,000/(1.15)^3 + €10\,000/(1.15)^4 + €13\,000/(1.15)^5 + €9\,000/(1.15)^6 = €45\,676.44$
 PV of C: $€5000 \times PVA(30, 10\%) = 9.4269 = €47\,134$
 PV of D: $€7000 \times PVA(20, 18\%) = 5.3527 = €37\,468 \times 1.18 = €44\,213$
- b Opportunities B and C are acceptable because the present value of their cash flows is in excess of their current cost of €45 000. Opportunities A and D are not acceptable because their present values are below their €45 000 cost.
- c None.

ST3-3 Assume you wish to establish a university scholarship of €2000 paid at the end of each year for a deserving student at the school you attended. You would like to make a lump-sum gift to the school to fund the scholarship into perpetuity. The school's treasurer assures you that they will earn 7.5 per cent annually forever.

- a How much must you give the school today to fund the proposed scholarship programme?
- b If you wanted to allow the amount of the scholarship to increase annually after the first award (end of year 1) by 3 per cent per year, how much must you give the school today to fund the scholarship programme?
- c Compare, contrast and discuss the difference in your response to parts (a) and (b).

Answer ST3-3

- a The present value of the proposed perpetuity is $€2000/0.075 = €26\,667$
- b The present value of the growing perpetuity is $€2060/(0.075 - 0.03) = €2060/0.045 = €45\,778$
- c The amount you need to give the high school if you want the scholarship to grow at 3 per cent per year indefinitely, assuming they will be able to earn the proposed interest rate, is almost double the amount needed if the scholarship does not grow. This effect is due to the fact that we discount the annual cash flow by a smaller number in order to account for the annual growth in the scholarship.

ST3-4 Assume that you deposit €10 000 today into an account paying 6 per cent annual interest and leave it on deposit for exactly eight years.

- a How much will be in the account at the end of eight years if interest is compounded
 - 1 annually?
 - 2 semi-annually?
 - 3 monthly?
 - 4 continuously?

- b Calculate the effective annual rate (EAR) for (1) to (4) above.
- c Based on your findings in parts (a) and (b), what is the general relationship between the frequency of compounding and EAR?

Answer ST3-4

- a
- 1 $FV = €10\,000 \times FV(8, 6\%) = 1.5938 = €15\,938$
 - 2 $FV = €10\,000 \times FV(16, 3\%) = 1.6047 = €16\,047$
 - 3 $FV = €10\,000 \times FV(96, 0.5\%) = 1.6141 = €16\,141$
 - 4 $FV = €10\,000 \times e^{(8 \times 0.06)} = €10\,000 \times 2.7182^{0.48} = €10\,000 \times 1.6161 = €16\,160$
- b
- 1 $EAR = (1 + 0.06/1)^1 - 1 = 6\%$
 - 2 $EAR = (1 + 0.06/2)^2 - 1 = 6.09\%$
 - 3 $EAR = (1 + 0.06/12)^{12} - 1 = 6.17\%$
 - 4 $EAR = e^{0.06} - 1 = 6.18\%$
- c The observable pattern shows that the more frequent the compounding, the higher the effective annual rate. Consequently, the higher annual rate is obtained when the compounding is continuous.

ST3-5 Imagine that you are a professional personal financial planner. One of your clients asks you the following two questions. Use time value of money techniques to develop appropriate responses to each question.

- a I borrowed €75 000, am required to repay it in six equal (annual) end-of-year instalments of €3344 and want to know what interest rate I am paying.
- b I need to save €37 000 over the next 15 years to fund my three-year-old daughter's university education. If I make equal annual end-of-year deposits into an account that earns 7 per cent annual interest, how large must this deposit be?

Answer ST3-5

- a 9% (calculated with a financial calculator)
- b The amount of the annual, end-of-year deposits should be:
 $€37\,000 / FVAF(15, 7\%) = 25.129 = €1472$

Chapter 4 Valuing Bonds

ST4-1 A five-year bond pays interest annually. The par value is €1000 and the coupon rate equals 7 per cent. If the market's required return on the bond is 8 per cent, what is the bond's market price?

Answer ST4-1

$$P = \frac{€70}{1.08^1} + \frac{€70}{1.08^2} + \frac{€70}{1.08^3} + \frac{€70}{1.08^4} + \frac{€1070}{1.08^5} = €960.07$$

You could also obtain this answer by valuing the annuity of coupon payments and the lump sum principal amount separately as follows.

$$\begin{aligned}
 P_0 &= \text{€}70 \left[\frac{1 - \frac{1}{(1 + 0.08)^5}}{0.08} \right] + \frac{\text{€}1000}{(1 + 0.08)^5} \\
 &= \text{€}279.49 + \text{€}680.58 = \text{€}960.07
 \end{aligned}$$

ST4-2 A bond that matures in two years makes semi-annual interest payments. The par value is €1000, the coupon rate equals 4 per cent and the bond's market price is €1019.27. What is the bond's yield to maturity?

Answer ST4-2

The YTM is the value of r that solves this equation.

$$\text{€}1019.27 = \frac{\text{€}20}{\left(1 + \frac{r}{2}\right)^1} + \frac{\text{€}20}{\left(1 + \frac{r}{2}\right)^2} + \frac{\text{€}20}{\left(1 + \frac{r}{2}\right)^3} + \frac{\text{€}1020}{\left(1 + \frac{r}{2}\right)^4}$$

Because the bond sells at a premium, the YTM must be less than the coupon rate. We can try to find the YTM by trial and error. Inserting $r = 0.035$ into the equation produces a price of €1009.58. This price is too low, so we have chosen a YTM that is too high. Next try $r = 0.03$. At that interest rate, the market price is €1019.27, so the YTM = 3 per cent.

An alternative approach to this problem uses the *Excel* function, =IRR. This function requires that you input the price of the bond as a negative value, followed by the positive cash flows that the bond promises.

	A
1	-1019.27
2	20
3	20
4	20
5	20

Now in an empty cell type the function, =IRR(A1:A5), and *Excel* will return the value 1.5 per cent. This is the YTM stated on a semi-annual basis (equivalent to $r/2$ in the equation above), so multiply it times 2 to get the annual YTM of 3 per cent. Note, you need to be sure that the cell in which you type the IRR formula is formatted in a way that allows you to see several decimal places. Otherwise, *Excel* may round off the YTM and you will not know it.

ST4-3 Two bonds offer a 5 per cent coupon rate, paid annually, and sell at par (€1000). One bond matures in two years and the other matures in ten years.

- What are the YTM's on each bond?
- If the YTM changes to 4 per cent, what happens to the price of each bond?
- What happens if the YTM changes to 6 per cent?

Answer ST4-3

Because the bonds currently sell at par, the coupon rate and the YTM must be equal at 5 per cent. If the YTM drops to 4 per cent, both bonds will sell at a premium,

but the price of the ten-year bond will increase more than the price of the two-year bond.

$$\begin{aligned}
 P_{2-yr} &= \text{€}50 \left[\frac{1 - \frac{1}{(1 + 0.04)^2}}{0.04} \right] + \frac{\text{€}1000}{(1 + 0.04)^2} \\
 &= \text{€}94.30 + \text{€}924.56 = \text{€}1018.86 \\
 P_{10-yr} &= \text{€}50 \left[\frac{1 - \frac{1}{(1 + 0.04)^{10}}}{0.04} \right] + \frac{\text{€}1000}{(1 + 0.04)^{10}} \\
 &= \text{€}405.55 + \text{€}675.56 = \text{€}1081.11
 \end{aligned}$$

Repeating the calculations above at $r = 0.06$ we find that the two-year bond's price falls to €981.67 and the ten-year bond's price falls to €926.40. This illustrates that long-term bond prices are more sensitive to changes in interest rates than are short-term bond prices.

Chapter 5 Valuing Shares

ST5-1 Omega Healthcare Investors (ticker symbol, OHI) pays a dividend on its Series B preference shares of \$0.539 per quarter. If the price of Series B preference shares is \$25 per share, what quarterly rate of return does the market require on this share, and what is the effective annual required return?

Answer ST5-1

The preference share valuation formula says that the price equals the dividend divided by the required rate of return. Therefore, using the quarterly dividend and the quarterly required rate, we have

$$\begin{aligned}
 \$25 &= \$0.539/r \\
 r &= 0.02156
 \end{aligned}$$

This means that the effective annual required rate on the stock equals

$$(1.02156)^4 - 1 = 0.089 \text{ or } 8.9\%$$

ST5-2 The restaurant chain Applebee's International, Inc. (ticker symbol, APPB) announced an increase of their quarterly dividend from \$0.06 to \$0.07 per share in December 2003. This continued a long string of dividend increases. Applebee's was one of few companies that had managed to increase its dividend at a double-digit clip for more than a decade. Suppose you want to use the dividend growth model to value Applebee's shares. You believe that dividends will keep growing at 10 per cent per year indefinitely, and you think the market's required return on this share is 11 per cent. Let's assume that Applebee's pays dividends annually and that the next dividend is expected to be \$0.31 per share. The dividend will arrive in exactly one year. What

would you pay for Applebee's shares right now? Suppose you buy the shares today, hold them just long enough to receive the next dividend, and then sell them. What rate of return will you earn on that investment?

Answer ST5-2

To calculate the price of the shares now, we simply divide next year's expected dividend, \$0.31, by the difference between the required rate of return and the dividend growth rate. This yields a price of $\$0.31 \div (0.11 - 0.10) = \31.00 . Next, we have to calculate the expected price a year from now after the \$0.31 dividend has been paid. To do that, we need an estimate of the dividend two years in the future. If next year's dividend is \$0.31, then the following year's dividend should be 10 per cent more or \$0.341 per share. This means that the price of Applebee's shares, just after the \$0.31 dividend is paid should be $\$0.341 \div (0.11 - 0.10) = \34.10 . Now calculate your rate of return. You purchase the shares for €31. One year later you receive a dividend of \$0.31 and you immediately sell the shares for \$34.10, generating a capital gain of \$3.10. Your total return is therefore $(\$34.10 + \$0.31 - €31.00) \div \$31.00 = 0.11$ or 11 per cent. That shouldn't be a surprise because this is exactly the market's required return on the shares.

Chapter 6 The Trade-Off Between Risk and Return

ST6-1 Download from Thomson ONE the data for the five shares analysed over the 1986–2006 period. Calculate the standard deviation of these share returns over the four five-year periods. Have these shares become more or less volatile over time?

Answer ST6-1

The table below illustrates the calculations needed to solve this problem. First, calculate the average return. Next, subtract that average from each year's actual return, then square that difference. Add up the squared differences and divide by four to get the variance, and take the square root of the variance to get the standard deviation. Returns were more volatile over the past five years compared to the past ten years.

YEAR	RETURN (%)	RETURN – AVERAGE	SQUARED DIFFERENCE
1999	23.6	21.1	445.2
2000	–10.9	–13.4	179.6
2001	–11.0	–13.5	182.2
2002	–20.9	–23.4	547.6
2003	31.6	29.1	847.8
Sum	12.4		2201.4
Average return (%)	2.5		
Variance			550.3
Standard dev. (%)			23.4

ST6-2 Suppose that short-term government debt returns follow a normal distribution with a mean of 4.1 per cent and a standard deviation of 2.8 per cent. This implies that, 68 per cent of the time, short-term government debt returns should fall within what range?

Answer ST6-2

For any normal distribution, 68 per cent of the observations should fall within plus or minus one standard deviation of the mean. This means 68 per cent of annual short-term government debt returns should fall within 1.3 per cent and 6.9 per cent.

Chapter 7 Risk, Return and the Capital Asset Pricing Model

ST7-1 Calculate the arithmetic mean, variance and standard deviations for a share with the probability distribution outlined in the accompanying table:

OUTCOME	PROBABILITY	SHARE RETURN
Recession	10%	-40%
Expansion	60%	20%
Boom	30%	50%

Answer ST7-1

The expected return is $0.10(-0.40) + 0.60(0.20) + 0.30(0.50) = 0.23$. The variance equals $0.10(-0.4 - 0.23)^2 + 0.60(0.2 - 0.23)^2 + 0.30(0.50 - 0.23)^2 = 0.0621$. The standard deviation is the square root of the variance, or 0.2492.

ST7-2 You invest €25 000 in T-bills and €50 000 in the market portfolio. If the risk-free rate equals 2 per cent and the expected market risk premium is 6 per cent, what is the expected return on your portfolio?

Answer ST7-2

The portfolio is invested one-third in T-bills (€25K/€75K) and two-thirds in shares (€50K/€75K). The risk-free rate is 2 per cent. If the market risk premium is 6 per cent, then the market's expected return is 8 per cent. Therefore, the portfolio's expected return is: $0.33(2\%) + 0.67(8\%) = 6\%$

ST7-3 The risk-free rate equals 4 per cent, and the expected return on the market is 10 per cent. If a share's expected return is 13 per cent, what is the share's beta?

Answer ST7-3

Plug the known values into Equation 7.2:

$$13\% = 4\% + B(10\% - 4\%)$$

which implies that the beta equals 1.5.

Chapter 8 Capital Budgeting Process and Techniques

ST8-1 Nader International is considering investing in two assets – A and B. The initial outlay, annual cash flows and annual depreciation for each asset is shown in the table below for the assets' assumed five-year lives. As can be seen, Nader will use straight-line depreciation over each asset's five-year life. The firm

requires a 12 per cent return on each of those equally risky assets. Nader's maximum payback period is 2.5 years, its maximum discounted payback period is 3.25 years and its minimum accounting rate of return is 30 per cent.

INITIAL OUTLAY (CF_0) YEAR (t)	ASSET A €200 000		ASSET B €180 000	
	CASH FLOW (CF_t)	DEPRECIATION	CASH FLOW (CF_t)	DEPRECIATION
1	€ 70 000	€40 000	€80 000	€36 000
2	80 000	40 000	90 000	36 000
3	90 000	40 000	30 000	36 000
4	90 000	40 000	40 000	36 000
5	100 000	40 000	40 000	36 000

- Calculate the accounting rate of return from each asset, assess its acceptability and indicate which asset is best, using the accounting rate of return.
- Calculate the payback period for each asset, assess its acceptability, and indicate which asset is best, using the payback period.
- Calculate the discounted payback for each asset, assess its acceptability, and indicate which asset is best, using the discounted payback.
- Compute and contrast your findings in parts (a), (b) and (c). Which asset would you recommend to Nader, assuming that they are mutually exclusive? Why?

Answer ST8-1

INVEST YEAR	CF	ASSET A €200 000		ASSET B €180 000		
		12% PV	DEPR.	CF	12% PV	DEPR.
1	€ 70 000	62 500	€40 000	€80 000	71 429	€36 000
2	80 000	63 776	40 000	90 000	71 747	36 000
3	90 000	64 060	40 000	30 000	21 353	36 000
4	90 000	57 196	40 000	40 000	25 420	36 000
5	100 000		40 000	40 000		36 000

a Accounting rate of return

YEAR	ASSET A NPAT	ASSET B NPAT
1	€70 000 – €40 000 = €30 000	€80 000 – €36 000 = €44 000
2	€80 000 – €40 000 = €40 000	€90 000 – €36 000 = €54 000
3	€90 000 – €40 000 = €50 000	€30 000 – €36 000 = –€6 000
4	€90 000 – €40 000 = €50 000	€40 000 – €36 000 = €4 000
5	€100 000 – €40 000 = €60 000	€40 000 – €36 000 = €4 000
	Average = €46 000	Average = €20 000
	$\frac{€46000}{100000} = 46\%$ Acceptable	$\frac{€20000}{90000} = 22.22\%$ Not acceptable

MAX

2.50	b Payback	2.56 years / Not acceptable	2.33 years / Acceptable
3.25	c Discounted payback at 12%	3.17 years/Acceptable	3.62 years / Not acceptable

- d They should take asset A because its accounting rate of return is acceptable as is its discounted payback.

ST8-2 JK Products is considering investing in either of two competing projects that will allow the firm to eliminate a production bottleneck and meet the growing demand for its products. The firm's engineering department narrowed the alternatives down to two – Status Quo (SQ) and High Tech (HT). Working with the accounting and finance personnel, the firm's CFO developed the following estimates of the cash flows for SQ and HT over the relevant six-year time horizon. The firm has an 11 per cent required return and views these projects as equally risky.

	PROJECT SQ	PROJECT HT
INITIAL OUTFLOW (CF_0)	€670 000	€940 000
YEAR (t)	CASH INFLOWS (CF_t)	
1	€250 000	€170 000
2	200 000	180 000
3	170 000	200 000
4	150 000	250 000
5	130 000	300 000
6	130 000	550 000

- Calculate the net present value (NPV) of each project, assess its acceptability, and indicate which project is best, using NPV.
- Calculate the internal rate of return (IRR) of each project, assess its acceptability and indicate which project is best, using IRR.
- Calculate the profitability index (PI) of each project, assess its acceptability and indicate which project is best, using PI.
- Draw the NPV profile for project SQ and HT on the same set of axes and use this diagram to explain why the NPV and the IRR show different preferences for these two mutually exclusive projects. Discuss this difference in terms of both the 'scale problem' and the 'timing problem'.
- Which of the two mutually exclusive projects would you recommend that JK Products undertake? Why?

Answer ST8-2

	PROJECT SQ	PROJECT HT
a NPV	€87 313.87	€142 254.07*
b IRR	16.07%*	15.17%
c PI	1.13	1.15*

All measures indicate project acceptability:

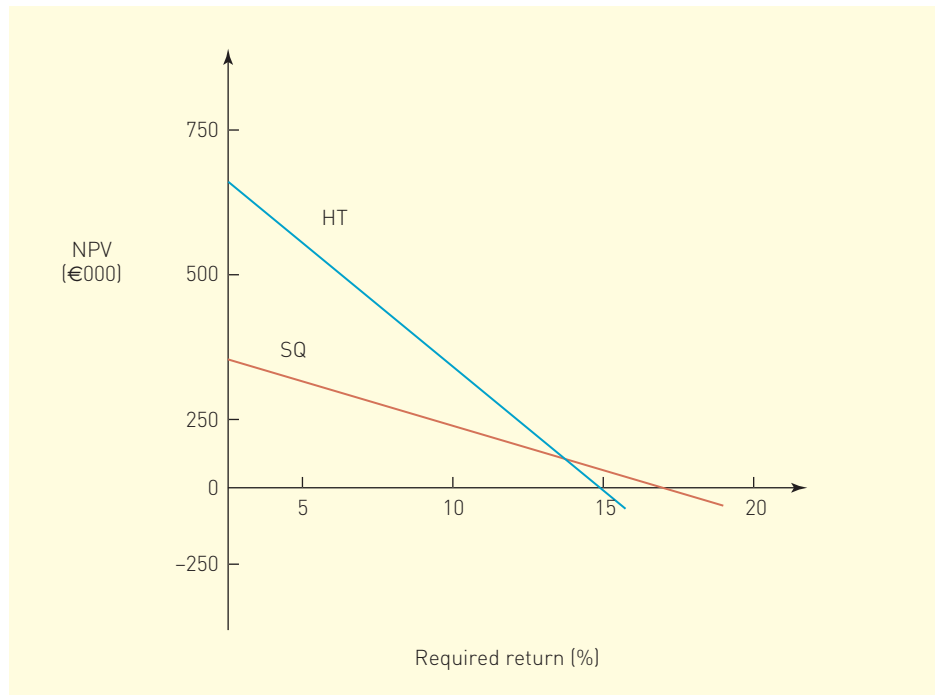
NPV > 0

IRR > 11%

PI > 1.00

*Indicates the preferred project using each measure.

d



RATE	PROJECT	
	SQ	HT
0%	€ 360 000	€ 710 000
11%	€ 87 313.87	€ 142 254.07
15.17%	—	0
16.07%	0	—

At 11 per cent HT is preferred over SQ, but because the profiles cross somewhere beyond 11 per cent and before the functions cross the required return axis, the IRR of SQ exceeds the IRR of HT. This behaviour can be explained by the fact that HT's larger scale causes its NPV to exceed that of SQ. The smaller project and the timing of SQ's cash flows – more in the early years – causes its IRR to exceed that of HT, which has more of its cash flows in later years.

- e Project HT is recommended because it has the higher NPV, the better technique. In addition, its PI is higher than that of Project SQ.

Chapter 9 Cash Flow and Capital Budgeting

ST9-1 Claross Ltd wants to determine the relevant operating cash flows associated with the proposed purchase of a new piece of equipment that has an installed cost of €10 million and is depreciated over five years. The firm's financial analyst estimated that the relevant time horizon for analysis is six years. She expects the revenues attributable to the equipment to be €15.8 million in the first year and to increase at 5 per cent per year through year 6. Similarly, she estimates all expenses, other than depreciation attributable to the equipment, to

total €12.2 million in the first year and to increase by 4 per cent per year through year 6. She plans to ignore any cash flows after year 6. The firm has a marginal tax rate of 40 per cent and its required return on the equipment investment is 13 per cent. (Note: round all cash flow calculations to the nearest €0.01 million.)

- Find the relevant incremental cash flows for years 0 through 6.
- Using the cash flows found in part (a), determine the NPV and IRR for the proposed equipment purchase.
- Based on your findings in part (b), would you recommend that Claross Ltd purchase the equipment? Why?

Answer ST9-1

a	YEAR						
	0	1	2	3	4	5	6
Initial investment	-10						
Revenue (+5%/yr)		15.80	16.59	17.42	18.29	19.21	20.17
Expenses (+4%/yr)		12.20	12.69	13.20	13.72	14.27	14.84
EBDT		3.60	3.90	4.22	4.57	4.94	5.33
-Depreciation		2.00	3.20	1.92	1.15	1.15	0.58
EBT		1.60	0.70	2.30	3.42	3.79	4.75
-Taxes (40%)		0.64	0.28	0.92	1.37	1.52	1.90
EAT		0.96	0.42	1.38	2.05	2.27	2.85
+Depreciation		2.00	3.20	1.92	1.15	1.15	0.58
Total cash flow	-10	2.96	3.62	3.30	3.20	3.42	3.43

- NPV at 13% = 3.21
IRR = 24%
- Accept the project because the NPV is greater than zero and the IRR is greater than 13%.

ST9-2 Atech Industries wants to determine whether it would be advisable for it to replace an existing, fully depreciated machine with a new one. The new machine will have an after-tax installed cost of €300 000 and will be depreciated under a three-year schedule. The old machine can be sold today for €80 000, after taxes. The firm is in the 40 per cent marginal tax bracket and requires a minimum return on the replacement decision of 15 per cent. The firm's estimates of its revenues and expenses (excluding depreciation) for both the new and the old machine (in € thousands) over the next four years are given below.

YEAR	NEW MACHINE		OLD MACHINE	
	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)	REVENUE	EXPENSES (EXCLUDING DEPRECIATION)
1	€925	€740	€625	€580
2	990	780	645	595
3	1 000	825	670	610
4	1 100	875	695	630

Atech also estimates the values of various current accounts that could be impacted by the proposed replacement. They are shown below for both the new and the old machine over the next four years. Currently (at time 0), the firm's net investment in these current accounts is assumed to be €110 000 with the new machine and €75 000 with the old machine.

NEW MACHINE	YEAR			
	1	2	3	4
Cash	€20 000	€25 000	€30 000	€36 000
Accounts receivable	90 000	95 000	110 000	120 000
Inventory	80 000	90 000	100 000	105 000
Accounts payable	60 000	65 000	70 000	72 000

OLD MACHINE	YEAR			
	1	2	3	4
Cash	€15 000	€15 000	€15 000	€15 000
Accounts receivable	60 000	64 000	68 000	70 000
Inventory	45 000	48 000	52 000	55 000
Accounts payable	33 000	35 000	38 000	40 000

Atech estimates that after four years of detailed cash flow development, it will assume, in analysing this replacement decision, that the year 4 incremental cash flows of the new machine over the old machine will grow at a compound annual rate of 2 per cent from the end of year 4 to infinity.

- Find the incremental operating cash flows (including any working capital investment) for years 1 to 4, for Atech's proposed machine replacement decision.
- Calculate the terminal value of Atech's proposed machine replacement at the end of year 4.
- Show the relevant cash flows (initial outlay, operating cash flows and terminal cash flow) for years 1 to 4, for Atech's proposed machine replacement.
- Using the relevant cash flows from part (c), find the NPV and IRR for Atech's proposed machine replacement.
- Based on your findings in part (d), what recommendation would you make to Atech regarding its proposed machine replacement?

Answer ST9-2

a	YEAR				
	0	1	2	3	4
NEW MACHINE					
Investment	-300 000				
Revenue		925 000	990 000	1 000 000	1 100 000
-Expenses (excl. depr.)		740 000	780 000	825 000	875 000
-Depreciation*		99 990	133 350	44 430	22 230
EBT		85 010	76 650	130 570	202 770
EAT [(1-0.40) × EBT]		51 006	45 990	78 342	121 662
-W/C investment**		20 000	15 000	25 000	19 000
(1) Operating CF		31 006	30 990	53 342	102 662

OLD MACHINE

A/T sale proceeds	+ 80,000				
Revenue		625 000	645 000	670 000	695 000
– Expenses(excl. depr.)		580 000	595 000	610 000	630 000
– Depreciation		0	0	0	0
EBT		45 000	50 000	60 000	65 000
EAT [(1–0.40) × EBT]		27 000	30 000	36 000	39 000
– W/C investment***		12 000	5 000	5 000	3 000
(2) Operating CF		15 000	25 000	31 000	36 000
INCR. CF[(1)–(2)]	– 220 000	16 006	5 990	22 342	66 662

* New asset depreciation:

YEAR	RATE	COST	DEPRECIATION
1	0.3333	€300 000	€ 99 990
2	0.4445	300 000	133 350
3	0.1481	300 000	44 430
4	0.0741	300 000	22 230

** New machine working capital investment:

NWC = Cash + Accounts Receivable + Inventory – Accounts Payable

 $\Delta\text{NWC} = \text{NWC} - [\text{Prior year's NWC}]$ Year 1 $\Delta\text{NWC} = \text{€}20\,000 + \text{€}90\,000 + \text{€}80\,000 - \text{€}60\,000 - [\text{€}110\,000] = \text{€}20\,000$ Year 2 $\Delta\text{NWC} = \text{€}25\,000 + \text{€}95\,000 + \text{€}90\,000 - \text{€}65\,000 - [\text{€}130\,000] = \text{€}15\,000$ Year 3 $\Delta\text{NWC} = \text{€}30\,000 + \text{€}110\,000 + \text{€}100\,000 - \text{€}70\,000 - [\text{€}145\,000] = \text{€}25\,000$ Year 4 $\Delta\text{NWC} = \text{€}36\,000 + \text{€}120\,000 + \text{€}105\,000 - \text{€}72\,000 - [\text{€}170\,000] = \text{€}19\,000$

*** Old machine working capital investment:

NWC = Cash + Accounts Receivable + Inventory – Accounts Payable

 $\Delta\text{NWC} = \text{NWC} - [\text{Prior year's NWC}]$ Year 1 $\Delta\text{NWC} = \text{€}15\,000 + \text{€}60\,000 + \text{€}45\,000 - \text{€}33\,000 - [\text{€}75\,000] = \text{€}12\,000$ Year 2 $\Delta\text{NWC} = \text{€}15\,000 + \text{€}64\,000 + \text{€}48\,000 - \text{€}35\,000 - [\text{€}87\,000] = \text{€}5\,000$ Year 3 $\Delta\text{NWC} = \text{€}15\,000 + \text{€}68\,000 + \text{€}52\,000 - \text{€}38\,000 - [\text{€}92\,000] = \text{€}5\,000$ Year 4 $\Delta\text{NWC} = \text{€}15\,000 + \text{€}70\,000 + \text{€}55\,000 - \text{€}40\,000 - [\text{€}97\,000] = \text{€}3\,000$ **b** Year 5 operating CF = $\text{€}66\,662 \times (1+0.02)^1 = \text{€}67\,995$ Terminal value at end of Year 4 = $\frac{\text{€}67\,995}{0.15 - 0.02} = \text{€}523\,038$ **c** Relevant cash flows:Total year 4 CF = $\text{€}66\,662 + \text{€}523\,038 = \text{€}589\,700$

YEAR	CASH FLOW
0	–€220 000
1	16 006
2	5 990
3	22 342
4	589 700

d NPV @ 15% = $\text{€}150\,301$

IRR = 31.92%

e Atech should undertake the proposed machine replacement because the NPV of $\text{€}150\,301$ is greater than $\text{€}0$ and the IRR of 31.92 per cent is above the firm's 15 per cent required return.**ST9-3** Performance Ltd is faced with choosing between two mutually exclusive projects with differing lives. It requires a return of 12 per cent on these projects. Project A requires an initial outlay at time 0 of $\text{€}5\,000\,000$ and is

expected to require annual maintenance cash outflows of €3 100 000 per year over its two-year life. Project B requires an initial outlay at time 0 of €6 000 000 and is expected to require annual maintenance cash outflows of €2 600 000 per year over its three-year life. Both projects are acceptable investments and provide equal quality service. The firm assumes that the replacement and maintenance costs for both projects will remain unchanged over time.

- Find the NPV of each project over its life.
- Which project would you recommend, based on your finding in part (a)? What is wrong with choosing the best project based on its NPV?
- Use the equivalent annual cost (EAC) method to compare the two projects.
- Which project would you recommend, based on your finding in part (c)? Compare and contrast this recommendation with the one you gave in part (b).

Answer ST9-3

- Project A NPV = $-\text{€}10\,239\,158$
Project B NPV = $-\text{€}12\,244\,761$
- Project A would be recommended because it has the lower cost NPV. The problem with this comparison is that Project A provides service for only two years versus Project B's three-year service life.
- EAC for Project A = $\text{€}6\,058\,490$
EAC for Project B = $\text{€}5\,098\,094$
- Project B is preferred based on its lower EAC, which means that when costs are viewed on an annual basis it is less expensive than Project A. This recommendation is superior to the one made in part (b) because by looking at annual cost it resolves the issue of differing service lives when the replacement and maintenance costs are assumed unchanged over time.

Chapter 10 Capital Cost and Capital Budgeting

ST10-1 A financial analyst for Quality Investments, a diversified investment fund, has gathered the following information for the years 2005 and 2006 on two firms – A and B – that it is considering adding to its portfolio. Of particular concern are the operating and financial risks of each firm.

	2005		2006	
	FIRM A	FIRM B	FIRM A	FIRM B
Sales (€mn)	10.7	13.9	11.6	14.6
EBIT (€mn)	5.7	7.4	6.2	8.1
Assets (€mn)			10.7	15.6
Debt (€mn)			5.8	9.3
Interest (€mn)			0.6	1.0
Equity (€mn)			4.9	6.3

- Use the data provided to assess the operating leverage of each firm (using 2005 as the point of reference). Which firm has more operating leverage?

- b Use the data provided to assess each firm's ROE (cash to equity/equity), assuming the firm's return on assets is 10 per cent and 20 per cent in each case. Which firm has more financial leverage?
- c Use your findings in parts (a) and (b) to compare and contrast the operating and financial risks of Firms A and B. Which firm is more risky? Explain.

Answer ST10-1

- a
$$\text{Operating leverage} = \frac{\overline{\Delta \text{EBIT}}}{\overline{\Delta \text{Sales}}} = \frac{\text{EBIT}}{\text{Sales}}$$
- Firm A: $[(6.2 - 5.7) \div 5.7] \div [(11.6 - 10.7) \div 10.7] = 0.0877 = 0.0841 = 1.0428$
- Firm B: $[(8.1 - 7.4) \div 7.4] \div [(14.6 - 13.9) \div 13.9] \div 0.0946 = 0.0504 = 1.8770$

Firm B has more operating leverage than Firm A given its considerably higher ratio noted above. Based on 2005 sales, Firm B would experience a 1.8770 per cent change in its EBIT for every 1 per cent change in sales, whereas Firm A would only experience a 1.0428 per cent change in EBIT for a 1 per cent change in sales.

b

	FIRM A	FIRM B
When return on assets equals 10%		
EBIT (\$)	$0.10 \times 10.7 = 1.07$	$0.10 \times 15.6 = 1.56$
Less: Interest (\$)	<u>0.60</u>	<u>1.00</u>
Cash to equity (\$)	0.47	0.56
ROE	$0.47 \div 4.9 = 9.59\%$	$0.56 \div 6.3 = 8.89\%$
When return on assets equals 20%		
EBIT (\$)	$0.20 \times 10.7 = 2.14$	$0.20 \times 15.6 = 3.12$
Less: Interest (\$)	<u>0.60</u>	<u>1.00</u>
Cash to equity (\$)	1.54	2.12
ROE	$1.54 \div 4.9 = 31.43\%$	$2.12 \div 6.3 = 33.65\%$

Firm B has more financial leverage as demonstrated by the broader range of ROEs it experiences when the return on assets moves from 10 per cent to 20 per cent. Note that Firm B's ROE is lower than Firm A's at the 10 per cent return on assets and it is higher than Firm B's ROE at the 20 per cent return on assets. Firm B's ROE has greater variability – is more responsive to changes in return on assets – than Firm A's ROE. Simply stated, Firm B has more financial risk than Firm A.

- c Based on the findings in parts (a) and (b), it is clear that Firm B is riskier than Firm A given that both its operating leverage (risk) and financial leverage (risk) are greater than that of Firm A.

ST10-2 Sierra Vista Industries (SVI) wishes to estimate its cost of capital for use in analysing projects that are similar to those that already exist. The firm's current capital structure, in terms of market value, includes 40 per cent debt, 10 per cent preference shares and 50 per cent ordinary shares. The firm's debt has an average yield to maturity of 8.3 per cent. Its preference shares have a €70 par value, an 8 per cent dividend, and are currently selling for €76 per share. SVI's beta is 1.05, the risk-free rate is 4 per cent and the return on the S&P 500 (the market proxy) is 11.4 per cent. SVI is in the 40 per cent marginal tax bracket.

- a What are SVI's pre-tax costs of debt, preference shares and ordinary shares?

- b** Calculate SVI's weighted average cost of capital (WACC) on both a pre-tax and an after-tax basis. Which WACC should SVI use when making investment decisions?
- c** SVI is contemplating a major investment that is expected to increase both its operating and financial leverage. Its new capital structure will contain 50 per cent debt, 10 per cent preference shares and 40 per cent ordinary shares. As a result of the proposed investment, the firm's average yield to maturity on debt is expected to increase to 9 per cent, the market value of preference shares is expected to fall to their €70 par value and its beta is expected to rise to 1.15. What effect will this investment have on SVI's WACC? Explain your finding.

Answer ST10-2

- a** Cost of debt = 8.30%
 Cost of preference shares = $(0.08 \times €70) \div €76 = €5.60 \div €76 = 7.37\%$
 Cost of ordinary shares (using CAPM) = $4.00\% + [1.05 \times (11.40\% - 4.00\%)]$
 $= 4.00\% + 7.77\%$
 $= 11.77\%$
- b** WACC (pre-tax) = $(0.40 \times 8.30\%) + (0.10 \times 7.37\%) + (0.50 \times 11.77\%)$
 $= 3.32\% + 0.74\% + 5.89\%$
 $= 9.95\%$
 WACC (after-tax) = $[(1.00 - 0.40) \times (0.40 \times 8.30\%)] + (0.10 \times 7.37\%)$
 $+ (0.50 \times 11.77\%)$
 $= 1.99\% + 0.74\% + 5.89\%$
 $= 8.62\%$
- c** Cost of debt = 9.00%
 Cost of preference shares = $(0.08 \times €70) \div €70 = €5.60 \div €70 = 8.00\%$
 Cost of ordinary shares (using CAPM) = $4.00\% + [1.15 \times (11.40\% - 4.00\%)]$
 $= 4.00\% + 8.51\%$
 $= 12.51\%$
 WACC (after-tax) = $[(1.00 - 0.40) \times (0.50 \times 9.00\%)] + (0.10 \times 8.00\%)$
 $+ (0.40 \times 12.51\%)$
 $= 2.70\% + 0.80\% + 5.00\%$
 $= 8.50\%$

As a result of the proposed risk-increasing investment, SVI's after-tax WACC drops slightly from 8.62 per cent to 8.50 per cent. This result may seem a bit inconsistent with expectations, but can be explained by the fact that the increased financial leverage resulted in a higher proportion of debt in the firm's capital structure. In spite of the increased pre-tax costs of each source of financing, the tax-deductibility of the increased proportion of debt more than compensated for them, thereby lowering SVI's WACC.

Chapter 11 Raising Long-Term Equity Financing

ST11-1 Last year Guaraldi Instruments conducted an IPO, issuing 2 million ordinary shares with a par value of €0.25 to investors, at a price of €15 per share. During its first year of operation, Guaraldi earned net income of €0.07 per share and paid a dividend of €0.005 per share. At the end of the year, the company's shares were selling for €20 each. Construct the equity account for Guaraldi at the end of its first year in business and calculate the firm's market capitalization.

Answer ST11-1

Immediately after the IPO, during which Guaraldi Instruments sold 2 million shares with a par value of €0.25 each at a price of €15 each, the company's equity account would have the following entries:

Ordinary shares, at par value ($€0.25 \times 2$ million)	€ 500 000
Paid-in capital surplus ($(€15.00 - €0.25) \times 2$ million)	29 500 000
Retained earnings	<u>0</u>
Total shareholders' equity	30 000 000

After the first year's net income (after dividend payments) are credited to Guaraldi's balance sheet, the equity accounts will have the following entries:

Ordinary shares, at par value ($€0.25 \times 2$ million)	€ 500 000
Paid-in capital surplus ($(€15.00 - €0.25) \times 2$ million)	29 500 000
Retained earnings ($(€0.07 - €0.005) \times 2$ million)	<u>130 000</u>
Total shareholders' equity	30 130 000

Guaraldi's market capitalization at the end of the first year would be €40 million ($€20/\text{share} \times 2$ million shares).

ST11-2 The Bloomington Company needs to raise €20 million of new equity capital. Its share price is currently €42. The investment bankers require an underwriting spread of 7 per cent of the offering price. The company's legal, accounting and printing expenses associated with the seasoned offering are estimated to be €450 000. How many new shares must the company sell to net €20 million?

Answer ST11-2

The Bloomington Company needs to raise $€20\,000\,000 + €450\,000 = €20\,450\,000$

$$7\% \times 42 = €2.94$$

The shares will net €39.06 a share ($€42.00 - €2.94$)

$$€20\,450\,000 / €39.06 = 523\,554 \text{ shares}$$

ST11-3 Assume that Zurich Semiconductor Company (ZSC) wants to create a sponsored ADR programme, worth \$75 million, to trade its shares on the NASDAQ stock market. Assume that ZSC is currently selling on the SWX Swiss Exchange for SF25.00 per share, and the current dollar/Swiss franc exchange rate is \$0.8000/SF. American Bank and Trust (ABT) is handling the ADR issue for ZSC and has advised the company that the ideal trading price for high-technology shares on the NASDAQ is about \$60 per share (or per ADR).

- Describe the precise steps ABT must take to create an ADR issue that meets ZSC's preferences.
- Assume that ZSC's share price declines from SF25.00 to SF22.50. If the exchange rate does not also change, what will happen to ZSC's ADR price?
- If the Swiss franc depreciates from \$0.8000/SF to \$0.7500/SF, but the price of ZSC's shares remains unchanged in Swiss francs, how will ZSC's ADR price change?

Answer ST11-3

- a** ZSC wants to start an ADR programme equivalent to about \$75 million.
 Current ZSC stock price = SF25.00
 Exchange rate: \$0.8000/SF
 Current ZSC stock price in dollars = SF25.00 × \$0.8000 = \$20.00/share
 Since the preferred ADR price is about \$60/share, bundle three ZSC shares into each ADR
 ADR price in dollars = 3 × \$20/share = \$60
 To raise roughly \$75 million, ZSC must sell about 1 250 000 ADRs at \$60 each.
 To begin ADR creation process, ABT would purchase 3 750 000 shares of ZSC (1.25 ADR × shs/ADR).
- Step 1: Purchase 3 750 000 ZSC shares = 3 750 000 × SF25.00/share = SF93 750 000
- Step 2: Package shares into 1 250 000 ADRs and sell to US buyers for \$60/ADR, raising 1 250 000 ADRs × \$60/ADR = \$75 000 000.
- Step 3: Convert dollar proceeds from selling ADRs into Swiss francs to cover cost of purchasing stock \$75 000 000 ÷ \$0.8000/SF = SF93 750 000; this covers ABT's costs.
- b** New ADR price in dollars: SF22.50/share × 3 shares/ADR × \$0.8000/SF = \$54/ADR
- c** New ADR price in dollars: SF25.00/share × 3 shares/ADR × \$0.7500/SF = \$56.25/ADR

Chapter 12 Capital Structure

- ST12-1** As financial director of the United Service Corporation (USC), you are considering a recapitalization plan that would convert USC from its current all-equity capital structure to one including substantial financial leverage. USC now has 150 000 shares outstanding, which are selling for €80.00 each. The recapitalization proposal is to issue €6 000 000 worth of long-term debt, at an interest rate of 7.0 per cent, and use the proceeds to repurchase 75 000 shares worth €6 000 000. USC's earnings in the next year will depend on the state of the economy. If there is normal growth, EBIT will be €1 200 000. EBIT will be €600 000 if there is a recession, and EBIT will be €1 800 000 if there is an economic boom. You believe that each economic outcome is equally likely. Assume there are no market frictions such as corporate or personal income taxes.
- a** If the proposed recapitalization is adopted, calculate the number of shares outstanding, the per-share price and the debt-to-equity ratio for USC.
- b** Calculate the earnings per share (EPS) and the return on equity for USC shareholders, under all three economic outcomes (recession, normal growth and boom), for both the current all-equity capitalization and the proposed mixed debt/equity capital structure.
- c** Calculate the breakeven level of EBIT, where earnings per share for USC shareholders are the same, under the current and proposed capital structures.
- d** At what level of EBIT will USC shareholders earn zero *EPS*, under the current and the proposed capital structures?

Answer ST12-1

- a** If USC issues €6 000 000 worth of debt and repurchases 75 000 shares worth €6 000 000, this implies that the shares will be repurchased at a price of €80 each ($€6\,000\,000 \div 75\,000$ shares). After this transaction, 75 000 shares will remain outstanding, each worth €80, for a total equity value of €6 000 000. The debt-to-equity ratio will therefore be 1.0 ($€6\,000\,000$ debt \div $€6\,000\,000$ equity).
- b** Expected operating profits, cash flows to shareholders and bondholders under current and proposed capital structure for USC for three equally likely economic outcomes:

EBIT	RECESSION		NORMAL GROWTH		BOOM	
	€600 000		€1 200 000		€1 800 000	
	ALL-EQUITY FINANCING	50% DEBT: 50% EQUITY	ALL-EQUITY FINANCING	50% DEBT: 50% EQUITY	ALL-EQUITY FINANCING	50% DEBT: 50% EQUITY
Interest (7.0%)	€ 0	€ 420 000	€ 0	€420 000	€ 0	€420 000
Net income	€600 000	€180 000	€1 200 000	€780 000	€1 800 000	€1 380 000
Shares outstanding	150 000	75 000	150 000	75 000	150 000	75 000
Earnings per share	€4.00	€2.40	€8.00	€10.40	€12.00	€18.40
% Return on shares ($P_0 = €80.00/\text{share}$)	5.0%	3.0%	10.0%	13.00%	15.0%	23.0%

- c** The breakeven point is EBIT equal to twice the interest payment, or €840 000 ($2 \times €420\,000$ interest). At that level of EBIT, earnings per share will be €5.60 per share under both the current all-equity capitalization ($€840\,000$ EBIT \div 150 000 shares O/S) and under the 50% debt, 50% equity capital structure [$(€840\,000$ EBIT $-$ $€420\,000$ interest) \div 75 000 shares O/S].
- d** Under the current all-equity capitalization, shareholders will earn positive EPS for any EBIT above zero, so EBIT = €0 is where EPS = €0. Under the proposed capital structure, EPS = €0 where EBIT = interest payments = €420 000.

ST12-2 An unlevered company operates in perfect markets and has net operating income (EBIT) of €2 000 000. Assume that the required return on assets for firms in this industry is 8 per cent. The firm issues €10 million worth of debt, with a required return of 6.5 per cent, and uses the proceeds to repurchase outstanding shares. There are no corporate or personal taxes.

- a** What is the market value and required return of this firm's shares before the repurchase transaction, according to M&M Proposition I?
- b** What is the market value and required return of this firm's remaining shares after the repurchase transaction, according to M&M Proposition II?

Answer ST12-2

- a** Before the share repurchase, the value of the firm is $EBIT/r = \text{€}2\,000\,000/0.08 = \text{€}25\,000\,000$. The required return on the shares (all-equity financing) is 8.0%.
- b** After the repurchase, the firm has $\text{€}10\,000\,000$ debt and $\text{€}15\,000\,000$ equity, so the debt-to-equity ratio is 0.6667 and the new required return on equity is
- $$r_1 = r + (r - r_d)D/E = 0.08 + (0.08 - 0.065) \times 0.6667 = 0.08 + 0.01 = 0.09 \text{ or } 9\%$$

ST12-3 Westside Manufacturing has EBIT of $\text{€}10$ million. There is $\text{€}60$ million of debt outstanding, with a required rate of return of 6.5 per cent. The required rate of return on the industry is 10 per cent. The corporate tax rate is 30 per cent. Assume there are corporate taxes but no personal taxes.

- a** Determine the present value of the interest tax shield of Westside Manufacturing, as well as the total value of the firm.
- b** Determine the gain from leverage, if personal taxes of 10 per cent on share income and 35 per cent on debt income exist.

Answer ST12-3

	LEVERED	UNLEVERED
EBIT	€10 000 000	€10 000 000
- Interest paid $[0.065 \times \text{€}60,000,000]$	(3 900 000)	0
= Taxable income	€ 6 100 000	€10 000 000
- Taxes $[T_c = 0.30]$	(1 830 000)	(3 000 000)
= Net income	€ 4 270 000	€ 7 000 000
+ Interest paid	3 900 000	0
= Total income available to investors	<u>€ 8 170 000</u>	<u>€ 7 000 000</u>

- a** Present value of tax shield = Debt $\times T_c = \text{€}60\,000\,000 \times 0.30 = \text{€}18\,000\,000$
 Value unlevered firm = Net income \div Capitalization rate
 $= \text{€}7\,000\,000 \div 0.10$
 $= \text{€}70\,000\,000$
 Value of levered firm = Value unlevered firm + PV tax shields
 $= \text{€}70\,000\,000 + \text{€}18\,000\,000$
 $= \text{€}88\,000\,000$.

b

$$G_L = \left[1 - \frac{(1 - T_c)(1 - T_{ps})}{(1 - T_{pd})} \right] \times \left\{ 1 - \frac{[(1 - 0.3)(1 - 0.1)]}{(1 - 0.35)} \right\}$$

$$\times \$60\,000\,000$$

$$= \{1 - [(0.7)(0.0)] \div 0.65\} \times \text{€}60\,000\,000$$

$$= 0.0308 \times \text{€}60\,000\,000$$

$$= \text{€}1\,846\,153.85$$

ST12-4 You are the manager of a financially distressed company with $\text{€}10$ million in debt outstanding, which will mature in one month. Your firm currently

has €7 million cash on hand. Assume that you are offered the opportunity to invest in either of the two projects described below.

- **Project 1:** the opportunity to invest €7 million in risk-free government stock, with a 4 per cent annual interest rate (or a 0.333 per cent per month interest rate).
- **Project 2:** a high-risk gamble, which will pay off €12 million in one month, if it is successful (probability = 0.25), but will only pay €4 million if it is unsuccessful (probability = 0.75).
 - a Compute the expected pay-off for each project and state which one you would adopt if you were operating the firm in the shareholders' best interests? Why?
 - b Which project would you accept if the firm was unlevered? Why?
 - c Which project would you accept if the firm was organized as a partnership rather than a company? Why?

Answer ST12-4

- a Pay-off for Project 1: $€7\,000\,000 \times 1.00333 = €7\,023\,333$
 Pay-off for Project 2: $0.25 \times €12\,000\,000 + 0.75 \times €4\,000\,000 = €6\,000\,000$
 If you were operating in the shareholders' interests, Project 2 would be accepted. It gives a higher potential pay-off to shareholders if the project does well. Project 1 has a sure, but lower return, but its pay-off will accrue to bondholders, rather than shareholders. This is in spite of the fact that Project 2 clearly has a negative NPV – it pays off only €6 million and requires a €7 million investment. Note that these are future pay-offs – they need to be discounted at the appropriate cost of capital to determine NPV.
- b If the firm were unlevered, the firm would prefer Project 1. The pay-off for Project 1 is higher than the pay-off for Project 2. If the firm is unlevered, all of the return will accrue to shareholders, since there are no bondholders. An unlevered firm would reject Project 2.
- c If the firm were organized as a partnership rather than a company, then it would accept Project 1. In partnerships, the owners do not have the option to default on the firm's debt (i.e. they don't have limited liability), leaving the firm's assets in the hands of creditors. Therefore, without the option to default, partners have no incentive to underinvest. They will accept Project 1 because doing so reduces their expected losses when the firm goes bankrupt.

ST12-5 Run-and-Hide Detective Company currently has no debt and expects to earn €5 million in EBIT each year, for the foreseeable future. The required return on assets for detective companies of this type is 10.0 per cent, and the corporate tax rate is 35 per cent. There are no taxes on dividends or interest at the personal level. Run-and-Hide calculates that there is a 5 per cent chance that the firm will fall into bankruptcy in any given year. If bankruptcy does occur, it will impose direct and indirect costs, totalling €8 million. If necessary, they will use the industry required return for discounting bankruptcy costs.

- a Compute the present value of bankruptcy costs for Run-and-Hide.

- b Compute the overall value of the firm.
- c Recalculate the value of the company assuming that the firm's shareholders face a 15 per cent personal tax rate on equity income.

Answer ST12-5

- a For any given year, the expected value of bankruptcy costs will be equal to the probability of bankruptcy ($p = 0.05$) times the cost to the firm if bankruptcy occurs (€8 000 000), or €400 000 per year. Since direct bankruptcy (B/R) costs are usually only incurred by unprofitable firms – that are not currently paying corporate income taxes – and since indirect B/R costs are things such as opportunity costs like lost sales, loss of reputational capital and loss of key personnel, we will assume that all B/R costs are after-tax costs. The present value of bankruptcy costs, PV_{BR} , will then be equal to the sum of the stream of discounted expected annual bankruptcy costs, where the discount rate will be the industry required return ($r = 0.10$). Since this stream is a perpetuity, PV_{BR} will simply be the expected annual B/R costs divided by the discount rate:

$$PV_{BR} = \left[\frac{€400000}{0.10} \right] = €4\,000\,000$$

- b The overall value of the firm is computed using Equation 12.7, where V_U is the value of an unlevered firm (computed using Equation 12.3), V_L is the value of a levered firm, and PV_{TS} equals the present value of debt tax shields. Since there are, at present, no debt tax shields, we will simply compute firm value, V :

$$V_L = V = V_U + PV_{TS} - PV_{BR} \quad (\text{Equation 12.7})$$

$$V_U = \left[\frac{\text{EBIT}(1 - T_c)}{r} \right] = \frac{€5000000(0.65)}{0.10} = \frac{€3250000}{0.10} = €32\,500\,000$$

$$V = V_U - PV_{BR} = €32\,500\,000 - €4\,000\,000 = €28\,500\,000$$

- c Incorporating a personal tax rate on equity income into the valuation model of an unlevered firm presented in Equation 12.3 yields:

$$V_U = \left[\frac{\text{EBIT}(1 - T_c)(1 - T_{PS})}{r} \right]$$

$$= \frac{€5000000(0.65)(0.85)}{0.10} = \frac{€2762500}{0.10} = €27\,625\,000$$

And the new value of the firm, V , taking account of bankruptcy costs as well, becomes:

$$V = V_U - PV_{BR} = €27625000 - €4000000 = €26\,400\,000$$

Chapter 13 Dividend Policy

- ST13-1** What do record date, ex-dividend date and payment date mean, related to dividends? Why would you expect the price of a share to drop by the amount of the dividend on the ex-dividend date? What rationale has been offered for why this does not actually occur?

Answer ST13-1

When companies announce dividend payments, they state that the dividend will be paid to shareholders of record on a certain date, with payment to be made several days later. This means the cheque will be made out to shareholders on the company's registry as at, say 5 July, with payment actually being made on 15 July. About three days before the record date, the company's shares will trade ex-dividend, meaning that someone who purchases shares before this ex-dividend date will be recorded on the company's books before the record date and will receive the dividend payment. Someone who purchases shares on or after the ex-dividend date will not receive the dividend payment (it will go to the previous owner), as there will be insufficient time to record the new owner on the shareholders' registry before payment is made. The share price should therefore drop by about the amount of the dividend payment on the ex-dividend date, because the new purchaser must be compensated for the fact that the upcoming cash payment will be made to the previous owner. Historically, the average price drop on the ex-dividend day for US companies has been 50–65 per cent of the amount of the dividend paid, and this has been interpreted as a personal income tax effect. Since personal tax rates on dividend income have traditionally been taxed at a higher rate than on realized capital gains, most individual investors eager to sell shares would prefer to sell before the ex-dividend date – receiving their return as capital gains – rather than wait to receive the highly taxed cash dividend. For some expected ex-dividend day price drop investors will be indifferent between receiving €1 worth of capital gains rather than €0.50–€0.65 worth of cash dividends.

ST13-2 What has happened to the total volume of share repurchases announced by US public companies since 1982? Why did that year mark such an important milestone in the history of share repurchase programmes in the United States?

Answer ST13-2

The total value of share repurchases in the United States increased dramatically after 1992. During that year, the US Securities and Exchange Commission (SEC) spelled out the legal rules covering share repurchases, and this 'safe harbour' ruling clarified when corporate managers could execute repurchases without fear of being charged with insider trading by the SEC.

ST13-3 What has happened to the average cash dividend payout ratio of corporations worldwide over time? What explains this trend? How would your answer change if share repurchases were included in calculating dividend payout ratios?

ANSWER ST13-3

Not only has the fraction of corporations worldwide that pay dividends been declining steadily for the past 50 years, those companies that do pay regular cash dividends tend to pay out lower fractions of their earnings today than in the past. Focusing on the US market, a relative handful of 200 or so NYSE listed firms account for over half of the value of dividend payments in the United States, though

these companies are truly enormous and also account for the bulk of corporate profits each year. Several factors seem to account of this decline in the 'propensity to pay' among dividend-paying firms, including the rise of institutional investors worldwide (who presumably have less need for a regular cash payment than individual investors) and the increasing importance of technology and entrepreneurship in global business. These factors suggest both that corporate managers would have greater need to retain earnings for investment and that investors would have less desire to receive dividends. On the other hand, if share repurchases are included with regular cash dividends, then the picture of declining dividend payments reverses itself. By this measure, the aggregate 'payout ratio' of corporations worldwide has been steadily (if slightly) increasing over time, though it is still the same relative handful of companies that pay dividend and execute share repurchase programmes.

ST13-4 What does it mean to say that corporate managers 'smooth' cash dividend payments? Why do managers do this?

Answer ST13-4

Most firms will maintain a constant nominal dividend payment until the company's managers are convinced that corporate earnings have permanently changed. If the firm's 'permanent earnings' increase, then managers will increase the nominal dividend payment a little each quarter or year until a new equilibrium level of dividend payments close to the target payout ratio is reached. The company will then maintain the quarterly or annual dividend at this nominal level until the firm's permanent earnings change again. This pattern of stable nominal dividend payments, followed by slow and steady increases as the firm's managers adjust to new levels of permanent earnings, gives the observed dividend series a smooth pattern, so managers are said to smooth dividends if they follow a constant nominal dividend payment policy with a partial adjustment strategy – as most do.

ST13-5 What are the key assumptions and predictions of the signalling model of dividends? Are these predictions supported by empirical research findings?

Answer ST13-5

The signalling model of dividends predicts that managers will begin paying dividends in order to differentiate their 'strong' firms from weaker firms (with lower cash flows) in a market characterized by information asymmetries between managers and shareholders. In such an environment, investors cannot distinguish strong from weak companies, so managers of strong firms will incur all the costs (taxes, foregone investment, transaction costs of issuing new securities) of paying high dividends because their firms can afford to bear these costs while weaker firms cannot. Signalling with dividends is comparable to burning €100 bills in public; only the wealthiest individuals can afford to commit such a wasteful act, so the signal is credible to all who witness it. The signalling model predicts that the most profitable and most promising firms will pay the highest dividends. The prediction that more profitable firms will pay the highest dividends is partially supported by empirical research, but the most promising firms (high-tech and entrepreneurial companies) have low payouts, which contradicts the signalling model's predictions.

ST13-6 What is the expected relationship between dividend payout levels and the growth rate and availability of positive-NPV projects, under the agency cost model of dividends? What about the expected relationship between dividend payout and the diffuseness of firm shareholders? Free cash flow? Consider a firm, such as Microsoft, awash in free cash flow, available positive-NPV projects, and a relatively diffuse shareholder base in an industry with increasing competition. Does either the agency model or the signalling model adequately predict the dividend policy of Microsoft? Which does the better job?

Answer ST13-6

The agency cost model predicts that firms with many positive-NPV investment projects will have less need to pay out cash as dividends in order to overcome agency costs than will firms with few positive-NPV projects. Thus high-growth firms will have low dividend payouts. Firms with a tight ownership structure have few agency problems between managers and shareholders, so have less need to make large dividend payments. Most economists agree that Microsoft should pay out more of its cash holdings as dividends, and the firm recently has raised its payout level – though the current payments will not seriously reduce Microsoft’s cash mountain in the foreseeable future.

Chapter 14 Entrepreneurial Finance and Venture Capital

ST14-1 You are seeking €1.5 million from a venture capitalist to finance the launch of your online financial search engine. You and the VC agree that your venture is currently worth €3 million. When the company goes public in an IPO in five years, it is expected to have a market capitalization of €20 million. Given the company’s stage of development, the VC requires a 50 per cent return on investment. What fraction of the firm will the VC receive in exchange for its €1.5 million investment in your company?

Answer ST14-1

Expected market value in 5 years = €20 million

Required return on investment = 50%

Value of VC investment in 5 years = $€1500000 \times 1.50^5 =$
 $€1500000 \times 7.594 = €11\,390\,625$

Fraction equity received = $€11390625 \div €20000000 = 56.95\%$

ST14-2 An entrepreneur seeks €12 million from a VC fund. The entrepreneur and fund managers agree that the entrepreneur’s venture is currently worth €30 million and that the company is likely to be ready to go public in four years. At that time, the company is expected to have a net income of €9 million. Comparable firms are expected to be selling at a price/earnings ratio of 25. Given the company’s stage of development, the venture capital fund managers require a 40 per cent compound annual return on their investment. What fraction of the firm will the fund receive in exchange for its €12 million investment?

Answer ST14-2

Value of firm = Net income \times P/E multiple = €6 million \times 25 = €150 million

40% return is required on the investment
 $12000000 \times (1.40)^4 = \text{€}12000000 \times 3.842 = \text{€}46\,099\,200$
 $\text{€}46099200 \div \text{€}150000000 = 30.73\%$ of the firm.

ST14-3 Suppose that six out of ten investments made by a VC fund are a total loss, meaning that the return on each of them is –100 per cent. Of the remaining investments, three break even, earning a 0 per cent return. One investment pays off spectacularly and earns a 650 per cent return. What is the realized return on the VC fund's overall portfolio?

Answer ST14-3

This solution assumes that each of the ten investments are for equal euro; amounts. Therefore, each investment gets a portfolio weight of 10 per cent.

6 of 10 earn –100%, so expressed as a fraction of total portfolio (p/f) return:
 $(0.6 \times -1.00) = -0.60$

3 of 10 earn 0% return, so expressed as a fraction of total p/f return:
 $(0.2 \times 0) = 0$

One investment earns 650% (0.1×6.50)

Portfolio return (R) is thus calculated as:

$$R = (0.6 \times -1.00) + (0.3 \times 0) + (0.1 \times 6.50) \\ = -0.60 + 0 + 0.65 = 0.05$$

The portfolio's realized return will be 5.0%

Chapter 15 International Financial Management

ST15-1 Use Table 15.1 to determine the cross exchange rate between the British pound and the Japanese yen.

Answer ST15-1

$$(\text{£}/\text{€}0.6)/(\text{¥}/\text{€}149.6) = \text{£}0.004/\text{¥}$$

ST15-2 Suppose the spot exchange rate equals ¥100/\$, and the six-month forward rate equals ¥101/\$. An investor can purchase a US T-bill that matures in six months and earns an annual rate of return of 3 per cent. What would be the annual return on a similar Japanese investment?

Answer ST15-2

In order for interest rate parity to hold, we get:

$$101/100 = (1 + x)/1.015$$

$$x = 0.0252$$

Therefore, the annualized return on Japanese investment will be $2 \times 0.0252 = 5.03\%$.

Chapter 16 Risk Management

ST16-1 A certain commodity sells for €150 today. The present value of the cost of storing this commodity for one year is €10. The risk-free

rate is 4 per cent. What is a fair price for a one-year forward contract on this asset?

Answer ST16-1

Use Equation 16.2 to solve this problem:

$$F = (150 + 10)(1.04) = 166.40$$

ST16-2 The spot exchange rate is \$1.6666/£. The risk-free rate is 4 per cent in the United States and 6 per cent in the United Kingdom. What is the forward exchange rate (assume a one-year contract)?

Answer ST16-2

Use Equation 16.3 here, but remember that we need to express the exchange rates in terms of foreign currency per unit of domestic currency. If we treat the \$ as the domestic currency, then the spot rate is $1/(\$1.6666/£)$ or $£0.6000/\$$. So we have:

$$F = 0.6000(1.06)/1.04 = 0.6115$$

Chapter 17 Mergers, Acquisitions and Corporate Control

ST17-1 Mega Service Company (MSC) is offering to exchange 2.5 of its own shares for each shares of target firm Norman Corporation as consideration for a proposed merger. There are 10 million Norman Corporation shares outstanding, and its share price was €60 before the merger offer. MSC's pre-offer share price was €30. What is the control premium percentage offered? Now suppose that when the merger is consummated eight months later, MSC's share price drops to €25. At that point, what is the control premium per centage and total transaction value?

Answer ST17-1

The pre-offer value of Norman Corporation is €600 million (10 million shares \times €60/share) and Mega Service Company offered 2.5 of its own shares (worth €30/share) as payment, or €75 per share of Norman Corporation. The initial control premium offered is thus €15/share (€75 offer price – €60 market price) of Norman Corporation, which is a control premium percentage of 25 per cent (€15 premium \div €60 initial market price).

When the merger is completed, and MSC's share price has fallen to €25/share, the value actually received by Norman Corporation shareholders is only €62.50/share (€25/share MSC shares \times 2.5 shares MSC for each Norman Corporation share). Norman shareholders will thus actually receive a control premium of €2.50/share or 4.17 per cent (€2.50 premium \div €60 initial market price). At that point the total transaction value is €625 million (10 million shares \times €62.50/share).

ST17-2 You are the director of capital acquisitions for Morningside Hotel Company. One of the projects you are deliberating is the acquisition of Monroe Hospitality, a company that owns and operates a chain of

bed-and-breakfast inns. Susan Sharp, Monroe's owner, is willing to sell her company to Morningside only if she is offered an all-cash purchase price of €5 million. Your project analysis team estimates that the purchase of Monroe Hospitality will generate the following after-tax marginal cash flow:

YEAR	CASH FLOW
1	\$1 000 000
2	1 500 000
3	2 000 000
4	2 500 000
5	3 000 000

If you decide to go ahead with this acquisition, it will be funded with Morningside's standard mix of debt and equity, at the firm's weighted average (after-tax) cost of capital of 9 per cent. Morningside's tax rate is 30 per cent. Should you recommend acquiring Monroe Hospitality to your CEO?

Answer ST17-2

We use the 9 per cent WACC to find the present value of the forecast marginal cash flow.

$$\begin{aligned}
 \text{Present value} &= \frac{\text{€}1000000}{(1.09)^1} + \frac{\text{€}1500000}{(1.09)^2} + \frac{\text{€}2000000}{(1.09)^3} + \frac{\text{€}2500000}{(1.09)^4} + \frac{\text{€}3000000}{(1.09)^5} \\
 &= \text{€}917431 + \text{€}1262520 + \text{€}1544367 + \text{€}1771063 + \text{€}1949794 \\
 &= \text{€}7445175
 \end{aligned}$$

Because the present value of the marginal cash flow from the purchase of Monroe Hospitality of €7 445 175 is more than its €5 000 000 all-cash purchase price, the CEO should purchase Monroe.