Answers

Section C

Zeddemore Co

(a) (i) Current k_e:

Using Zeddemore's own equity beta:

$k_e = 4\% + 2{\cdot}3\ (10\% - 4\%) = 17{\cdot}8\%$

Project specific k_e:

Need to use the proxy (WCP) to derive a suitable beta as Zeddemore Co's own beta is not suitable for the new venture due to different risk.

Degear the proxy beta first.

Asset beta = equity beta x $\{V_e/(V_e + V_d \times (1 - t))\}$

$V_e = 100m \times \$2{\cdot}60 = \$260m$

$V_d = \$110m \times 0{\cdot}96 = \$105{\cdot}6m$

Asset beta = $1{\cdot}25 \times \{\$260m/(\$260m + \$105{\cdot}6m \times (1 - 0{\cdot}2))\} = 0{\cdot}94$

Now regear using Zeddemore Co's gearing:

$V_e = \$40m/\$0{\cdot}50 \times \$1{\cdot}05 = \$84m$

V_d (Loan notes) = $\$250m \times 0{\cdot}65 = \$162{\cdot}5m$

V_d (Loan) = $\$20m$

Total $V_d = \$162{\cdot}5m + \$20m = \$182{\cdot}5m$

Equity beta = asset beta x $\{(V_e + V_d(1 - t))/V_e\}$

Equity beta = $0{\cdot}94 \times \{(\$84m + \$182{\cdot}5m \times (1 - 0{\cdot}2))/\$84m\} = 2{\cdot}57$

$k_e = 4\% + 2{\cdot}57 \times (10\% - 4\%) = 19{\cdot}42\%$

(ii) Comment

The project-specific cost of equity is higher than the current cost of equity, indicating that a higher return would be needed by shareholders to compensate for the higher risk of the new venture. Appraising the venture using the existing cost of equity, as advised by the commercial director, would therefore result in an over-statement of the venture's net present value, potentially leading to an incorrect decision being made.

(b) Gearing problems

Increased earnings volatility

High gearing increases the volatility of Zeddemore Co's earnings as the interest payable is unaffected by any change in the activity level. If Zeddemore Co experiences a reduction in its activity level, the percentage reduction in earnings will be greater than the percentage reduction in activity level. This increased volatility in earnings represents the financial risk of the company.

Cost of equity finance

Increased volatility of earnings will increase the cost of equity, making equity finance more expensive. The financial risk premium can be seen by comparing the asset beta of 0·94 (k_e = 9·64%) with the equity beta of 2·57 (k_e = 19·42%).

Debt capacity

The gearing level will affect Zeddemore Co's ability to raise new debt finance and how much debt it can support (debt capacity). Given its high gearing level, Zeddemore Co may find that it cannot raise any more debt finance.

Bankruptcy risk

High gearing leads to a high interest obligation for Zeddemore Co and an increased risk of being unable to pay all of its interest following an unexpected reduction in profits/cash flow. This could result in default by Zeddemore Co on its interest payments and subsequent forced liquidation by its lenders.

Note: Only three problems were required.

(c) Risk-return relationship

The risk-return relationship explains why different sources of finance have different costs. An investor's required rate of return will be determined primarily by the level of risk the investment has. If an investment carries a high level of risk, the investor will require a high rate of return to compensate for that risk. Investing in a low-risk investment will mean a lower level of return will be required.

A rational investor would not invest in a high-risk investment offering a low return as they could obtain the same return from a lower-risk investment. A low-risk investment offering high returns would not exist as it would be undervalued and the high demand for that investment would increase the price and therefore reduce the return.

Zeddemore Co's finance costs

The risk-return relationship will result in Zeddemore Co's shareholders and lenders having different required rates of return.

The equity holders have no guaranteed return as Zeddemore Co is under no obligation to pay a dividend each year and capital growth is also not guaranteed (in fact, the share price has fallen). Also, if the company was liquidated, the equity holders would come last in the order of payment and possibly receive nothing.

By comparison, the lenders (loan note holders and the bank) face lower risk as their interest is a contractual obligation and must be paid. The fall in share price will not directly affect the lenders as they do not participate in any capital growth/decline. Zeddemore Co's lenders do face the risk of default in the event of Zeddemore Co being unable to pay the interest, but both the loan notes and the bank loan are secured on Zeddemore Co's assets so the risk of any loss on default is reduced, assuming the assets realise sufficient value to repay the debt.

The above effects can be seen in Zeddemore Co's finance costs with their cost of equity being higher than their cost of debt. For example, the current cost of equity is 17·8% which is higher than the cost of the bank loan which is only 7%. The loan notes are also cheaper, costing 10% ($6·50/$65·00). The loan notes are more expensive than the bank loan as they are irredeemable and thus have no guaranteed repayment date, increasing the risk compared with the bank loan which is repayable in the future.

Cabreras Co

(a) Optimal replacement interval

	Y0 $000	Y1 $000	Y2 $000	Y3 $000	Y4 $000
Three-year interval					
Purchase cost		(800·0)			
Maintenance cost (w1)		(20·0)	(21·0)	(22·1)	
Fuel cost		(28·0)	(33·0)	(38·0)	
Resale value (w2)				270·0	
Net cash flow	0·0	(848·0)	(54·0)	210·0	
Present value factors at 8%	1·000	0·926	0·857	0·794	
Present value	0·0	(785·2)	(46·3)	166·7	
Net present value	(664·8)				
Equivalent annual cost (w3)	(258·0)				

	Y0 $000	Y1 $000	Y2 $000	Y3 $000	Y4 $000
Four-year interval					
Purchase cost		(800·0)			
Maintenance cost (w1)		(20·0)	(21·0)	(22·1)	(23·2)
Fuel cost		(28·0)	(33·0)	(38·0)	(43·0)
Safety test (w4)				(64·0)	
Resale value (w5)					202·5
Net cash flow	0·0	(848·0)	(54·0)	(124·1)	136·3
Present value factors at 8%	1·000	0·926	0·857	0·794	0·735
Present value	0·0	(785·2)	(46·3)	(98·5)	100·2
Net present value	(829·8)				
Equivalent annual cost (w6)	(250·5)				

Recommendation

The four-year replacement interval has the lowest equivalent annual cost and on an expected cost basis, Cabreras Co should replace the Beast every four years.

However, it is a close decision and there is a 20% chance that the cost of the government test will be $120,000 and this would make the four-year interval more expensive than the three-year option (working 7). Also, Cabreras Co should consider that it has only looked at three and four-year replacement intervals. Other, potentially cheaper, intervals should be considered.

Workings

Working 1 $20,000 x 1·05 = 21,000
$20,000 x $1·05^2$ = 22,050

Working 2 $800,000 x 0·6 x 0·75 x 0·75 = $270,000

Working 3 NPV/3-year annuity factor at 8% $664,800/2·577 = $258,000

Working 4 $50,000 x 0·8 + $120,000 x 0·2 = $64,000

Working 5 $800,000 x 0·6 x 0·75 x 0·75 x 0·75 = $202,500

Working 6 NPV/4-year annuity factor at 8% = $829,800/3·312 = $250,500

Working 7 Effect of government test costing $120,000

	Y0 $000	Y1 $000	Y2 $000	Y3 $000	Y4 $000
Purchase cost		(800·0)			
Maintenance cost (w1)		(20·0)	(21·0)	(22·1)	(23·2)
Fuel cost		(28·0)	(33·0)	(38·0)	(43·0)
Safety test				(120·0)	
Resale value					202·5
Net cash flow	0·0	(848·0)	(54·0)	(180·1)	136·3
Present value factors at 8%	1·000	0·926	0·857	0·794	0·735
Present value	0·0	(785·2)	(46·3)	(143·0)	100·2
Net present value	(874·3)				
Equivalent annual cost	(264·0)				

Note: *Working 7 is not required to get the marks available.*

(b) Rationale behind equivalent annual cost (EAC) based decisions

In simple situations, choosing between one-off projects of different length lives is quite straight forward; the NPV technique is used to evaluate the costs and benefits of a project over its life and the project with the largest NPV is selected in order to maximise shareholder wealth.

However, when projects with different length lives can be endlessly repeated, and form part of an infinite chain of identical projects, then the situation is more complicated. In this situation, project NPVs cannot be meaningfully compared. Is a chain of three-year projects with an NPV of $20 per project better than a chain of five-year projects with an NPV of $30 per project?

To answer this, the NPV earned by the project needs to be related to the period of time required to earn it.

Deciding the optimal replacement interval for an asset which will be required for the foreseeable future is very similar to the problem of choosing between investment projects of different length lives which form part of an infinite chain of similar projects.

Each possible replacement interval is a project (for example, a three-year replacement interval project, a four-year replacement interval project, etc). If the asset is going to be required by the business for the foreseeable future, then each replacement interval forms part of an infinite chain of similar replacement intervals.

To choose the optimal replacement interval, the NPV of each possible replacement interval needs to be calculated to take into account the time value of money and the costs and benefits which are spread across the interval.

In order to allow for the different lengths of the replacement intervals, the NPVs are divided by the annuity factor appropriate to their lives (three-year factors for a three-year interval, etc). The resultant figure is the EAC. The EAC represents the cost payable at the end of each year of the replacement interval which is equivalent to the NPV of the replacement interval.

The calculation above allows for the present value cost of the replacement interval and the length of the interval. If it is assumed that continual replacement of like with like assets continues, EACs for different lengths of replacement interval can be compared meaningfully to find the optimal replacement interval.

(c) Discounted cash flow (DCF) based methods of investment appraisal include NPV, IRR and discounted payback.

They all share the same two advantages.

First, they allow for the time value of money and recognise that a $ received today is worth more than a $ received in one year's time.

The two commonly used non-discounted cash flow methods of investment appraisal, accounting rate of return and payback, do not consider the time value of money.

Second, DCF methods are cash flow (rather than accounting profit) based. Cash is the lifeblood of a business and is used to pay the claims of stakeholders. Profit is an accounting concept. The amount of profit earned in a period is sometimes quite a subjective matter and depends upon the accounting policies followed. The amount of cash received in a period is a far more objective measure.

Accounting rate of return is based upon accounting profit and ignores cash flow.

Both NPV and IRR have clear cut decision rules which should lead to the maximisation of shareholder wealth. Under NPV, any projects with positive NPVs should be adopted and the size of the NPV is directly related to the increase in shareholder wealth from adopting the project. Under IRR, projects with IRRs bigger than the company's cost of capital should be adopted, and if they are, shareholder wealth will increase.

Accounting rate of return and payback have arbitrarily set targets based upon internal corporate targets.

NPV and IRR both consider returns earned throughout a project's life. Payback only considers returns up to the payback point, and as a result ignores later returns.

			Marks	*Marks*
Section C				
Zeddemore Co				
(a)	**(i)**	Current cost of equity	0·5	
		WCP Co equity MV	0·5	
		WCP Co debt MV	0·5	
		Asset beta	1	
		Number of shares	0·5	
		Zeddemore Co equity MV	0·5	
		Zeddemore Co debt MV	0·5	
		Total debt	0·5	
		Equity beta	1	
		Project cost of equity	0·5	
				6
	(ii)	Higher risk/return	1	
		Wrong decision	1	
				2
(b)		Problem 1	2	
		Problem 2	2	
		Problem 3	2	
				6
(c)		Risk-return principle	2	
		Equity v debt	2	
		Irredeemable debt	1	
		Secured debt	1	
				6
				20
Cabreras Co				
(a)		Purchase cost	0·5	
		3-year maintenance cost	1	
		3-year fuel cost	1	
		3-year resale value	1	
		3-year NPV	1	
		3-year EAC	0·5	
		4th year maintenance	0·5	
		4th year fuel	0·5	
		Safety test cost	1	
		4-year resale value	0·5	
		4-year NPV	1	
		4-year EAC	0·5	
		Recommendation	2	
				11
(b)		Discussion of EAC (up to 2 marks per relevant point)		4
(c)		Discussion of methods (up to 2 marks per relevant point)		5
				20