APPENDIX VII

Solutions to selected questions and problems

This Appendix provides suggested solutions to those end-of-chapter numerical questions and problems not marked with an asterisk*. Answers to questions and problems marked * are given in the *Lecturer's Guide*. Answers to discussion questions, essays and reports questions can be found by reading the text.

Chapter 1

No numerical questions; answers to all questions may be found by reading the text.

Chapter 2

1 Proast plc

a

	Project A				*Project B*			
Point in time (yearly intervals)	*Cash flow*	*Discount factor*		*Discounted cash flow*	*Cash flow*	*Discount factor*		*Discounted cash flow*
0	−120	1.0		−120.00	−120	1.0		−120.00
1	60	0.8696		52.176	15	0.8696		13.044
2	45	0.7561		34.025	45	0.7561		34.025
3	42	0.6575		27.615	55	0.6575		36.163
4	18	0.5718		10.292	60	0.5718		34.308
			NPV	4,108			NPV	−2.460
				£4,108				−£2,460

Advice: Accept project A and reject project B, because A generates a return greater than that required by the firm on projects of this risk class, but B does not.

b The figure of £4,108 for the NPV of project A can be interpreted as the surplus (in present value terms) above and beyond the required 15 per cent return. Therefore, Proast would be prepared to put up to £120,000 + £4,108 into this project at time zero, because it could thereby obtain the required rate of return of 15 per cent. If Proast put in any more than this, it would generate less than the opportunity cost of the finance providers.

Likewise, the maximum cash outflow at time zero (0) for project B which permits the generation of a 15 per cent return is £120,000 − £2,460 = £117,540.

2 Highflyer plc

a First, recognise that annuities are present (to save a lot of time).

Project A: Try 15%−420,000 + 150,000 × 2.855 = +£8,250.

Try 16%−420,000 + 150,000 × 2.7982 = −£270.

$$\text{IRR} = 15 + \frac{8{,}250}{8{,}250 + 270} \times (16 - 15) = 15.97\%$$

Project B: Try 31% and 32%.

Point in time (yearly intervals)	*Cash flow*	*Discounted cash flow @ 31%*	*Discounted cash flow @ 32%*
0	−100,000	−100,000	−100,000
1	75,000	57,252	56,818
2	75,000	43,704	43,044
		+956	−138

$$\text{IRR} = 31 + \frac{956}{956 + 138} \times (32 - 31) = 31.87\%$$

b NPV: Project A

−420,000 + 150,000 × 3.0373 = +£35,595

Project B

−100,000 + 75,000 × 1.6901 = +£26,758

c Comparison:

	IRR	*NPV*
Project A	15.97%	+£35,595
Project B	31.87%	+£26,758

If the projects were not mutually exclusive, Highflyer would be advised to accept both. If the firm has to choose between them, on the basis of the IRR calculation it would select B, but, if NPV is used, project A is the preferred choice. In mutually exclusive situations with projects generating more than the required rate of return, NPV is the superior decision-making tool. It measures in absolute amounts of money rather than in percentages and does not have the theoretical doubts about the reinvestment rate of return on intra-project cash inflows.

4

Point in time (yearly intervals)	*0*	*1*	*2*	*3*
Cash flow	−300	+260	−200	+600
Discount factor	1.0	0.885	0.7831	0.6931
Discounted cash flow	−300	+230.1	−156.62	+415.86

NPV = +£189.34

This project presents unconventional cash flows (more than one change in sign). Therefore there is more than one IRR, making a nonsense result.

5 a

Point in time (yearly intervals)	t_1	t_2	t_3	t_4	Total
Cash flow (£)	+200	+300	+250	+400	
Terminal (t_4) value (£)	+304.2	+396.8	+287.5	+400	1,388.5

b

$$\sqrt[4]{\frac{1{,}388.5}{900}} - 1 = 0.1145 \text{ or } 11.45\%$$

c Try 10%.

$$-900 + \frac{200}{1.10} + \frac{300}{(1.10)^2} + \frac{250}{(1.10)^3} + \frac{400}{(1.10)^4} = -9.2$$

Try 9%.

$$-900 + \frac{200}{1.09} + \frac{300}{(1.09)^2} + \frac{250}{(1.09)^3} + \frac{400}{(1.09)^4} = +12.4$$

$$\text{IRR} = 9 + \frac{12.4}{12.4 + 9.2}(10 - 9) = 9.57\%$$

6 a Modified internal rate of return

Point in time (yearly intervals)	t_1	t_2	t_3	t_4	Total
Cash flow (£)	5,400	3,100	2,800	600	
Terminal value	8,000.3	4,028.8	3,192	600	15,821.1

$$\sqrt[4]{\frac{15{,}821.1}{9{,}300}} - 1 = 0.142 \text{ or } 14.2\%$$

This project is accepted under the MIRR decision rule.

b Internal rate of return

Try 14%.

$$-9{,}300 + \frac{5{,}400}{1.14} + \frac{3{,}100}{(1.14)^2} + \frac{2{,}800}{(1.14)^3} + \frac{600}{(1.14)^4} = +67.4$$

Try 15%.

$$-9{,}300 + \frac{5{,}400}{1.15} + \frac{3{,}100}{(1.15)^2} + \frac{2{,}800}{(1.15)^3} + \frac{600}{(1.15)^4} = -76.2$$

$$14 + \frac{67.4}{67.4 + 76.2}(15 - 14) = 14.47\%$$

This project is accepted under the IRR decision rule.