Instructor's Manual

Financial Management for Decision Makers

Eighth Edition

Peter Atrill

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SECTION A

Author's Note to Tutors

Author's Note to Tutors

The text is designed to provide readers with a sound introduction to financial management. It assumes no previous knowledge of the subject and recognises that students using the text may come from a wide variety of backgrounds. The text, therefore, tries to avoid technical jargons and does not assume a high level of numerical ability from students. The text has been class tested by students on various courses and I have modified and refined the material to take account of their comments. In writing this eighth edition, I have also taken into account the views of lecturers who have used the text.

The text aims to encourage an active approach to learning by providing activities and self-assessment questions at appropriate points in the text. This is designed to stimulate thought concerning particular issues and to give the reader the opportunity to test his or her understanding of the principles covered. Fully annotated solutions are provided to activities and self-assessment questions in order to give the necessary feedback.

The structure of the text allows the tutor to deliver the subject in a number of ways. The text can be used as recommended reading for a traditional course based on lectures and tutorials. There are review questions and exercises at the end of each chapter, which can be used as the basis for tutorials. Answers to the review questions and to three of the exercises are given at the end of the text, and answers to the remaining exercises are given in this manual for tutors.

The text could also provide the basis for a distance-learning approach for part-time or off-campus students. For these students, the interactive nature of the book may be extremely useful where access to a tutor is restricted. The text can also be used as the basis for an open learning approach for full-time, campus-based students. I have used this method successfully at Plymouth Business School. In this case, the text is supplemented by a students' guide and by relevant articles where appropriate. Accounting surgeries can also be provided to give students the opportunity for one-to-one help with any problems they face.

The text is appropriate for modules that are meant to be covered in 150–200 hours of study. For full-time students, this will often be covered in one academic year (two semesters). For students that are only studying a one-semester course in financial management it will be necessary to adopt a selective approach to the chapters to be studied. It may be useful, for example, to concentrate on those chapters concerned with investment appraisal, financing and dividend policy in the time available. However, the selection of chapters should be determined by the objectives of the course and the background of the students.

There is a website to support this text, which contains multiple choice and short answer questions, exercises, and case studies along with solutions. There are also PowerPoint slides for lecturers.

I hope that you and your students will find the text both accessible and interesting. I welcome any suggestions that you may have on how the text can be improved.

Peter Atrill

April 2016

SECTION B

Solutions to Exercises

CHAPTER 2

Solution to Exercise 2.2

Davis Travel Ltd

(a) (i) *Projected cash flow statement for the six months to 31 March Year 5*

	Oct	Nov	Dec	Jan	Feb	Mar
Receipts	**£000**	**£000**	**£000**	**£000**	**£000**	**£000**
Deposits	30	90	90	90	–	–
Final balance	–	–	270	810	810	810
	30	90	360	900	810	810
Payments						
Payables	180					
Non-current assets						50
Loan repayment						20
Loan interest						10
Admin	60	60	60	60	60	60
Commission	-	30	90	90	90	-
Other variable costs	-	-	20	80	60	40
Hotels	-	-	100	400	300	200
Flights	-	-	50	200	150	100
Promotion	100	150	150	50	-	-
	340	240	470	880	660	480
Cash flow	(310)	(150)	(110)	20	150	330
Opening balance	30	(280)	(430)	(540)	(520)	(370)
Closing balance	(280)	(430)	(540)	(520)	(370)	(40)

(ii) *Projected income statement for the six months to 31 March Year 5*

	£000
Sales revenue	3,000
Flights	(500)
Promotion costs	(450)
Hotels	(1,000)
Admin costs	(360)
Other variable costs	(200)
Commission	(300)
Depreciation	(42)
Operating profit	148
Interest charges	(10)
Profit for the period	138

(iii) *Projected statement of financial position as at 31 March Year 5*

	£000
ASSETS	
Non-current assets (560 + 50 − 42)	568
Current assets	–
Total assets	568
EQUITY AND LIABILITIES	
Equity	
Share capital	100
Retained earnings	338
	438
Non-current liabilities	
Borrowings − loans (110 − 20)	90
Current liabilities	
Bank overdraft	40
Total equity and liabilities	568

(b) A major problem facing the business is the heavy cancellation charges that will have to be borne if sales do not meet expectations. Given the low profit margins and weak cash flows of the business, this obligation can provide a real threat to the viability of the business.

A further problem facing the business is the pattern of receipts and expenditures that it has. The business must pay large amounts out at the beginning of the season for advertising. As bookings have not been received at this point, the business is reliant on a large overdraft to meet these obligations. In the event that the bank withdraws its support the business would be in grave difficulties. It would be advisable to seek an injection of long-term funds to put the business on a sounder footing.

The profit is small in relation to the sales revenue and expenses of the business. A slight increase in expenses, without a corresponding increase in sales, could wipe out the projected profits.

Solution to Exercise 2.3

Fowler Ltd

(a) *Projected income statement for the year ending 31 October Year 8*

	£000
Sales revenue (1.8m × £1.20)	2,160
Variable expenses (1.8m × £0.35)	(630)
Fixed expenses (420 + 150)	(570)
Operating profit	960
Interest payable (Note 1)	(380)
Profit before taxation	580

Tax (30%)	(174)
Profit for the year	406

Note 1 Loan notes with a nominal value of £2.5m will be required to raise the cost of the new bottling line. Total interest payable is, therefore, [(£2.5m + £1.3m) × 10%] = £380,000

(b) (i) Earnings per share (EPS)

EPS = Profit available to ordinary shareholders / Ordinary shares in issue

Year 7	**Year 8**
£350	**£406**
2,000	**2,000**
17.5p	**20.3p**

(ii) Degree of operating gearing

DOG = Sales − Variable costs / Operating profit

Year 7	**Year 8**
£ (1,800 − 750)	**£ (2,160 − 630) × 100%**
£630	**£960**
1.67	**1.59**

(iii) Degree of financial gearing

DFG = Operating profit / Operating profit - Interest payable

Year 7	**Year 8**
£630	**£960**
£500	**£580**
1.26	**1.66**

(iv) Degree of combined gearing

DCG = DOG × DFG

Year 7	**Year 8**
1.67 × 1.26	**1.59 × 1.66**
2.10	**2.64**

(c) Investing in the new bottling line will increase profit for the year by 16 per cent and boost earnings per share by the same amount. Although variable costs are reduced, fixed expenses are increased, thereby increasing operating gearing. Other things being equal, this would increase the degree of operating gearing. However, as sales increased by 20 per cent, the degree of operating gearing has reduced slightly. This is because the impact of operating gearing becomes less pronounced the further away from the point at which sales (less variable costs) equal the fixed costs.

By financing the new bottling line through the use of loan notes, the financial gearing of the business is increased. This makes profits available to ordinary shareholders more sensitive to changes in operating profits. We can see a significant increase in the degree of financial gearing in Year 8.

The slight decrease in the degree of operating gearing is more than offset by the increase in the degree of financial gearing and so the degree of combined gearing has also increased significantly. Thus, returns to shareholders become more sensitive to changes in sales.

(d) The percentage reduction in EPS from the predicted level to the current level is:

$$= \frac{(20.3 - 17.5)}{20.3}$$

$$= 13.8\%$$

The percentage reduction in sales required to maintain EPS is:

$$= \frac{13.8\%}{2.64}$$

$$= 5.2\%$$

Thus, the sales required (in £000s) to maintain existing EPS is:

$$= 2{,}160 - (5.2\% \times 2{,}160)$$

$$= 2{,}048$$

Solution to Exercise 2.6

Newtake Records Ltd

(a) *Projected cash flow statement for the year to 30 November*

	June	July	Aug	Sept	Oct	Nov
	£000	£000	£000	£000	£000	£000
Cash receipts						
Sales (net of discount)	227	315	246	138	118	108
Cash payments						
Administration	40	41	38	33	31	30
Goods purchased	135	180	142	94	75	66
Finance expenses	5	5	5	5	5	5
Selling expenses	22	24	28	26	21	19
Tax paid			22			
Shop refurbishment		14	18	6		
	202	264	253	164	132	120
Cash surplus (deficit)	25	51	(7)	(26)	(14)	(12)
Opening balance	(35)	(10)	41	34	8	(6)
Closing balance	(10)	41	34	8	(6)	(18)

(b) *Projected inventories' movements for the six months to 30 November*

	June	July	Aug	Sept	Oct	Nov
	£000	£000	£000	£000	£000	£000
Opening inventories	112	154	104	48	39	33
Inventories purchased	180	142	94	75	66	57
	292	296	198	123	105	90
Cost of inventories sold (60% sales)	(138)	(192)	(150)	(84)	(72)	(66)
Closing inventories	154	104	48	39	33	24

(c) *Projected income statement for the six months ending 30 November*

	£000
Sales revenue	1,170
Cost of goods sold	(702)
Gross profit	468
Selling expenses	(136)
Administration expenses	(303)
Credit card charges [3% (50% × 1,170)]	(18)
Operating profit	11
Interest charges (20% × 30,000)	(6)
Profit for the period	5

(d) We are told that the business is required to eliminate the bank overdraft by the end of November. However, the projected cash flow statement reveals that this will not be achieved. There is a decline in the overdraft by nearly 50% over the period but this is not enough and ways must be found to comply with the bank's requirements. It may be possible to delay the refurbishment programme that is included in the projections or to obtain an injection of funds from the owners or other investors. It may also be possible to stimulate sales revenue in some way. However, there has been a decline in the sales since the end of July and the November sales is approximately one third of the July sales. The reasons for this decline should be sought.

The inventories level will fall below the minimum level for each of the last three months. However, to rectify this situation it will be necessary to purchase more inventories, which will, in turn, further exacerbate the cash flow problems of the business.

The projected income statement reveals a very low profit for the period. For every £1 of sales the business is only managing to generate 0.4p in profit. The business should look carefully at its pricing policies and its overhead expenses. The administration expenses, for example, absorb more than one quarter of the total sales turnover. Any reduction in overhead cash expenses will have a beneficial effect on cash flows.

Solution to Exercise 2.7

Eco-Energy Appliances Ltd

Projected cash flow statements

	Year 1	Year 2	Year 3	Year 4
	£	£	£	£
Sales revenue	1,200,000	1,440,000	1,500,000	1,400,000
Operating profit (15%)	180,000	216,000	225,000	210,000
Depreciation	70,000	70,000	70,000	80,000
Working capital*	(140,000)	(4,000)	(6,000)	10,000
Operating cash flows	110,000	282,000	289,000	300,000
Interest	(80,000)	(80,000)	(80,000)	(40,000)
Tax**		(20,000)	(27,000)	(29,000)
Dividends		(40,000)	(55,000)	(58,000)
Non-current assets				(100,000)
Loan repayment			(400,000)	
Net cash flows	30,000	142,000	(273,000)	73,000
Opening balance	125,000	155,000	297,000	24,000
Closing balance	155000	297,000	24,000	97,000

* In Year 2 the working capital requirement is £144,000 (that is, 10% of £1,440,000). The increase in working capital required is therefore £144,000 – £140,000 = £4,000. Similar calculations apply for subsequent years.

**The tax charge and dividends for each year are shown below.

	Year 1	Year 2	Year 3	Year 4
	£	£	£	£
Operating profit (as above)	180,000	216,000	225,000	210,000
Interest	80,000	80,000	80,000	40,000
Profit before tax	100,000	136,000	145,000	170,000
Tax (20%)	20,000	27,000	29,000	34,000
Profit for the period	80,000	109,000	116,000	136,000
Dividends (50%)	40,000	55,000	58,000	68,000

Note: Tax and dividends will be paid in the year after the relevant profit is made.

Solution to Exercise 3.3

Conday and Co. Ltd

(a) *Return on capital employed*

$$\frac{\text{Operating profit}}{\text{Equity + long-term borrowings}} \times 100\%$$

$$\frac{378}{1{,}265} \times 100\% = 29.9\%$$

Return on ordinary shareholders funds

$$\frac{\text{Profit for the year}}{\text{Share capital + reserves}} \times 100\%$$

$$\frac{225}{1{,}065} \times 100\% = 21.1\%$$

Gross profit margin

$$\frac{\text{Gross profit}}{\text{Sales revenue}} \times 100\%$$

$$\frac{980}{2{,}600} \times 100\% = 37.7\%$$

Operating profit margin

$$\frac{\text{Operating profit}}{\text{Sales revenue}} \times 100\%$$

$$\frac{378}{2{,}600} \times 100\% = 14.5\%$$

Sales revenue to capital employed

$$\frac{\text{Sales revenue}}{\text{Equity + non-current liabilities}}$$

$$\frac{2{,}600}{1{,}065 + 200} = 2.1 \text{ times}$$

Settlement period for trade receivables

$$\frac{\text{Trade receivables}}{\text{Credit sales revenue}} \times 365 \text{ days}$$

$$\frac{820}{2{,}600} \times 365 \text{ days} = 115 \text{ days}$$

Inventories turnover period

$$\frac{\text{Inventories held}}{\text{Cost of sales}} \times 365 \text{ days}$$

$$\frac{600}{1{,}620} \times 365 \text{ days} = 135 \text{ days}$$

The above ratios reveal that Conday and Co. Ltd is profitable. In particular, the return on ordinary shareholders funds and ROCE ratios seem to be high in relation to the returns achieved by more secure forms of investment such as government securities. However, whether this level of return is sufficient in relation to the risks involved is difficult to judge from the information available.

The settlement period for trade receivables seems very high, which may be due to the nature of the business. However, this high ratio, combined with the fact that the bad debts of the business account for more than 6% of total sales revenue, suggests that some tightening of credit control procedures may be required. The inventories turnover figure also seems high. The business is carrying more than four months' inventories. This may indicate a need also to improve inventories control procedures. At present, the business has a large bank overdraft and so major improvements in inventories control and credit control procedures may have a significant effect on both the liquidity and the profitability of the business.

Given the high level of bank borrowing, it is difficult to understand why such a high proportion of the profit for the year was distributed in the form of dividend. This is not a very prudent policy. The sales revenue to capital employed ratio seems quite low. This is due, at least in part, to the high levels of inventories and trade receivables that are being carried.

(b) Although the business is profitable, there are some doubts as to the quality of its management. The business has high levels of inventories and trade receivables and a large overdraft. It is possible that better management would not have allowed this situation to arise. It is possible, too, that better management of existing assets would remove the need for external sources of funds for expansion. It's interesting to speculate how £200,000 received from the issue of shares might be used by the managers. Would it be used to finance even higher levels of inventories and trade receivables without there being a corresponding increase in sales revenue?

The share price of £6.40 is much higher than the net asset value of the shares. At present, the net assets (assets less liabilities) have a statement of financial position value of £1,065,000 and there are 700,000 shares in issue. This gives a net asset value per share of £1.52. To justify paying £6.40, the investor would have to be convinced the business would generate high profits in the future.

Solution to Exercise 3.4

Helena Beauty Products Ltd

	2015	2016
Profitability ratios		
Operating profit margin	$\frac{80}{3{,}600} \times 100\% = 2.2\%$	$\frac{90}{3{,}840} \times 100\% = 2.3\%$
Gross profit margin	$\frac{1{,}440}{3{,}600} \times 100\% = 40\%$	$\frac{1{,}590}{3{,}840} \times 100\% = 41.4\%$
ROCE	$\frac{80}{2{,}668} \times 100\% = 3.0\%$	$\frac{90}{2{,}874} \times 100\% = 3.1\%$
Efficiency ratios		
Inventories turnover period	$\frac{(320 + 400)/2}{2{,}160} \times 365 = 61 \text{ days}$	$\frac{(400 + 500)/2}{2{,}250} \times 365 = 73 \text{ days}$

Trade receivables settlement period	$\frac{750}{3{,}600} \times 365 = 76$ days	$\frac{960}{3{,}840} \times 365 = 91$ days
Sales revenue/capital employed	$\frac{3{,}600}{2{,}668} = 1.3$ times	$\frac{3{,}840}{2{,}874} = 1.3$ times

These ratios reveal, what seems to be, a low operating profit margin in each year. The gross profit margin, however, is quite high in each year, suggesting that the business has high overheads. There was a slight increase of 1.4 percentage points in the gross profit margin during 2016, but this appears to have been largely swallowed up by increased overheads. As a result, the operating profit margin increased by only 0.1 percentage points in 2016. The low operating profit margin is matched by a seemingly rather low sales revenue to capital employed ratio in both years. The combined effect of this is a low return on capital employed ratio (ROCE) in both years. The ROCE for each year is lower than might be expected from investment in risk-free government securities. This must be unsatisfactory since investing in a business tends to be quite risky.

The inventories turnover period and settlement period for trade receivables have both increased significantly over the period. The settlement period seems to be high and should be a cause for concern. Although (in absolute terms) sales revenue increased during 2016, operating profit fell quite sharply. The directors should be concerned at the low level of profitability and efficiency of the business. In particular, an investigation should be carried out concerning the high level of overheads and the higher investment in inventories and trade receivables.

Solution to Exercise 3.5

Threads Limited

(a)	**2015**		**2016**	
ROCE	234/756	= 31.0%	167/845	= 19.8%
Operating profit margin	234/1180	= 19.8%	167/1200	= 13.9%
Gross profit margin	500/1180	= 42.4%	450/1200	= 37.5%
Current ratio	253/199	= 1.3:1	396/238	= 1.7:1
Acid test ratio	105/199	= 0.5:1	160/238	= 0.7:1
Trade receivables settlement period	102/1180 × 365	= 32 days	156/1200 × 365	= 47 days
Trade payables settlement period	60/680* × 365	= 32 days	76/750* × 365	= 37 days

Inventories turnover	148/680 × 365	= 79 days	236/750 × 365	= 115 days

*The credit purchases figure is not available, so the cost of sales figure has been used. This only provides a rough approximation of the trade payables settlement period.

(b) A supplier seeking to sell a substantial amount of goods to the business will be concerned with both liquidity and longer-term viability (where there is a continuing relationship) as measured by profitability ratios. The supplier will also be interested in the average time taken by the business to pay its current suppliers.

- The liquidity ratios reveal an apparent improvement over the two years. However, for a manufacturing business, the liquidity ratios seem low and the supplier may feel some concern. The increase in inventories over the period has led to a greater improvement in the current ratio than in the liquid (acid test) ratio. The improvement in the acid test ratio has not been very great and some concern over the business's liquidity position must remain.

- The settlement period allowed to credit customers (trade receivables) has increased substantially in 2016. This may be a deliberate policy. However, if this is the case, the effect of a more liberal credit policy has not proved to be very successful as there has only been a slight increase in sales revenue in 2016. The credit period increase may be due, on the other hand, to other factors such as poor credit control or particular customers experiencing financial difficulties. The effect of this change in the trade receivables ratio should be carefully noted by the supplier as the increase in trade receivables outstanding seems to be partly financed by an increase in the average settlement period for trade payables.

- The inventories turnover period has increased significantly in 2016. This might be due to inventories building in anticipation of future sales revenue. However, it might indicate that certain products are not selling as well as expected and are, therefore, remaining in inventories.

- The gross profit margin and operating profit margins are both lower in 2016. Lower margins have, in turn, led to a lower return on capital employed. The lower operating profit margins, the increase in the average settlement period allowed to trade receivables and the increase in the inventories turnover period may suggest that the business has a product range that is becoming obsolete and, therefore, more difficult to sell. It might, however, also suggest a more competitive business environment.

The ratios calculated above do not indicate any serious problems for the business. However, it is clear that 2016 proved to be a more difficult year than 2015. Things may well improve in the future though. At this point, however, the supplier would be well advised to be cautious in its dealings with the business. Certainly, the supplier should not rely too heavily on Threads Limited for future sales revenue.

Solution to Exercise 3.6

Genesis Ltd

(a)

Current ratio = $\frac{232}{550} = 0.42:1$

Acid test ratio = $\frac{104}{550} = 0.19:1$

Inventories turnover period = $\frac{128}{1,248} \times 365 = 37 \text{ days}$

Settlement period for trade receivables = $\frac{104}{1,640} \times 365 = 23 \text{ days}$

Settlement period for trade payables = $\frac{184}{1,260} \times 365 = 53 \text{ days}$

It is difficult to make a judgement about such matters with no equivalent ratios for past periods, other businesses or the business's own plans, but there is some evidence that this business is, in fact, overtrading. Both of the liquidity ratios look weak. The acid test ratio should probably be around 1:1. Customers are paying more than twice as quickly as suppliers are being paid. This suggests that pressure may be being applied to the former to pay quickly, perhaps with adverse results. It may also imply that payments are being delayed to suppliers because of a lack of available finance.

(b) Overtrading must be dealt with either by increasing the level of funding to match the level of activity, or by reducing the level of activity to match the funds available. The latter option may result in a reduction in operating profit in the short term but may be necessary to ensure long-term survival.

CHAPTER 4

Solution to Exercise 4.2

Arkwright Mills plc

(a) and **(b)**

Incremental cash flows

	Year 0 £m	Year 1 £m	Year 2 £m	Year 3 £m	Year 4 £m	Year 5 £m	Year 6 £m
Profit before tax and after depreciation		0.20	0.30	0.30	0.30	0.30	
Depreciation		0.20	0.20	0.20	0.20	0.20	
Tax (50%)			(0.10)	(0.15)	(0.15)	(0.15)	(0.15)
Working capital investment	(0.60)					0.60	
Non-current asset investment	(1.00)						
Annual net cash flows	(1.60)	0.40	0.40	0.35	0.35	0.95	(0.15)
Discount factor 10%	1.000	0.909	0.826	0.751	0.683	0.621	0.564
Present value	(1.600)	0.364	0.330	0.263	0.239	0.590	(0.085)
NPV	0.101						

On the basis of NPV, the project should be undertaken (the NPV of the project is positive).

Note: For the sake of simplicity, the question assumes that the depreciation charge will be allowable for tax calculation purposes. However, in practice, the tax authorities will normally make a separate calculation (referred to as a capital allowance calculation) to replace the depreciation charge when calculating the liability for corporation tax.

(c) The payback period is the time taken for the initial investment to be recouped. In this case, the investment will pay back by the end of year 5 (see below).

	Year 0 £m	Year 1 £m	Year 2 £m	Year 3 £m	Year 4 £m	Year 5 £m	Year 6 £m
Annual net cash flows	(1.60)	0.40	0.40	0.35	0.35	0.95	(0.15)
Cumulative net cash flows	(1.60)	(1.20)	(0.80)	(0.45)	(0.10)	0.85	0.70

Solution to Exercise 4.3

C. George (Controls) Ltd

(a) and **(b)**

The potential variable cost savings per unit of the product is as follows:

	£	
Labour	2.10	(that is, £3.30 − £1.20)
Materials	0.45	(that is, £3.65 − £3.20)
Variable overheads	0.18	(that is, £1.58 − £1.40)
	2.73 × 50,000	

= £136,500 each year

Incremental cash flows

	Year 0	Year 1	Year 2	Year 3	Year 4
	£000	£000	£000	£000	£000
Variable cost savings		136.5	136.5	136.5	136.5
New equipment	(670.0)				70.0
Old equipment	150.0				(40.0)
Working capital	130.0				(130.0)
	(390.0)	136.5	136.5	136.5	36.5
Discount factors	1.000	0.893	0.797	0.712	0.636
Present values	(390.0)	121.9	108.8	97.2	23.2
NPV	(38.9)				

(c) Since the NPV is negative, the project would have an adverse effect on the wealth of the shareholders of the business and should not be pursued.

(d) Cash flow projections are used rather than profit projections since it is cash that gives command over resources. It is only when the cash is paid or received that the opportunity to deploy it elsewhere is lost or gained respectively.

In the long run, profit and cash flows should be equal; however, the timing of the flows will be different.

Solution to Exercise 4.4

The accountant

(a)	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
	£000	£000	£000	£000	£000	£000
Sales revenue		450	470	470	470	470
Working capital recovered						180
		450	470	470	470	650
Materials		126	132	132	132	132
Labour		90	94	94	94	94
Overheads		30	30	30	30	30
Working capital	180					
New equipment	500					
	680	246	256	256	256	256
Incremental cash flows	(680)	204	214	214	214	394

Notes:

- Working capital invested in this project at the start will be recovered at the end of the project's life.
- The relevant overheads figure is £30,000 a year additional cost that the project is expected to cause.
- Depreciation is not a cash flow.
- Interest on the working capital investment, and indeed on other aspects of this investment, is dealt with by discounting.
- The development cost is not a relevant cost, since it has been incurred already and is not affected by the decision to be made.
- The cost of the equipment to start this project is the £500,000 that must be spent. The carrying value of the old machine is not relevant since this does not represent an outlay or an opportunity cash flow.

(b)

(i) **Payback period**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
	£000	£000	£000	£000	£000	£000
Incremental cash flows	(680)	204	214	214	214	394
Cumulative incremental cash flows	(680)	(476)	(262)	(48)	166	560

Thus, the payback point occurs in Year 4, that is, after just over 3 years (assuming cash flows accrue evenly over the year).

(ii) **NPV**	**Year 0**	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
	£000	£000	£000	£000	£000	£000
Incremental cash flows	(680)	204	214	214	214	394
Discount factor	1.000	0.893	0.797	0.712	0.636	0.567
Present values	(680)	182.2	170.6	152.4	136.1	223.4
NPV	184.7					

(c) A memo to the board might include the following points:

- The fact that the project has a significant positive NPV, which would increase shareholder wealth.
- The fact that the project has a relatively short payback period.
- The figures in the analysis ignore taxation, which should be considered before a final decision is made.
- The question of risk should be considered before a final decision is made.

Solution to Exercise 4.7

Haverhill Engineers Ltd

(a) The first step is to calculate the cash savings from the new machine:

	Per unit cash flow	
	Old line	**New line**
	p	p
Selling price	150	150
Less		
Materials	(40)	(36)
Labour	(22)	(10)
Variable overheads	(14)	(14)
Cash contribution	74	90

The cash saving per unit is (90p − 74p) = 16p; thus, the cash saving for 1,000,000 units per year is 1,000,000 × 16p = £160,000.

The incremental cash flows arising from the project are:

	Year					
	0	**1**	**2**	**3**	**4**	**5**
	£000	**£000**	**£000**	**£000**	**£000**	**£000**
Cash savings		160	160	160	160	160
New machine	(700)					100
Old machine residual value	50					
Working capital	160					(160)
Net cash flows	(490)	160	160	160	160	100

(b) *NPV method:*

Discount factor	1.000	0.909	0.826	0.751	0.683	0.621
Present value	(490)	145.4	132.2	120.2	109.3	62.1
NPV	79.2					

Thus, the project's NPV is £79,200.

(c) *IRR method:*

Discount factor (20%)	1.000	0.833	0.694	0.579	0.482	0.402
Present value	(490.0)	133.3	111.0	92.6	77.1	40.2
NPV	(35.8)					

We can see that increasing the discount rate from 10 per cent to 20 per cent, an increase of 10 percentage points, decreases the NPV from +79.2 to −35.8, a decrease of 115.0. This is an average decrease of 11.5 per 1 per cent increase in the discount rate. The rate at which the project would have a zero NPV (the IRR) is, therefore, about 10 per cent + (79.2/11.5) = 16.9 per cent, that is, about 17.0 per cent.

(d) NPV is the difference between the future cash inflows and outflows relating to a project after taking account of the time value of money. The time value of money is taken into account by discounting the future cash flows using the cost of finance as the appropriate discount rate. The decision rule for NPV is that projects with a positive NPV should be accepted as this will lead to an increase in shareholder wealth.

The internal rate of return is that discount rate that, when applied to the future cash flows of the projects, produces a zero NPV. The IRR is compared to a 'hurdle rate' determined by management to see whether the project should be undertaken.

The IRR approach is currently as popular as the NPV method among practising managers. Managers appear to like to use percentage figures as a basis for evaluating projects rather than absolute figures. However, the IRR method has a number of disadvantages compared to the NPV method that were discussed in the chapter.

Normally, the two methods will always give the same solution concerning acceptance/rejection of a project and will usually give the same solution concerning the ranking of projects. However, where a difference occurs it is the NPV method that provides the more reliable answer. As a result the NPV approach is considered to be the more appropriate method to adopt.