Chapter 7 Questions

1. **The Tullane Biscuit Company** is a successful biscuit manufacturer. Since it was established five years ago it has gradually increased its range of plain and cheese biscuits. The sales director has now come to the board with a proposal to expand the range further into chocolate coated biscuits. This will involve the purchase of new machinery; the initial outlay will be €135,000. The finance director and the sales director meet to discuss sales projections for the new range of chocolate biscuits. They forecast the following net cash inflows over the five year period until the machinery will need to be replaced:

	€
Year 1	35,000
Year 2	47,000
Year 3	52,000
Year 4	55,000
Year 5	55,000

In addition to these inflows, it is expected that the machinery will be sold for scrap at the end of year five for €10,000. The company's policy is to depreciate machinery on the straight line basis over its estimated useful economic life.

Required:

a) calculate ARR for the investment project

b) calculate the payback period for the project

2. **Ul-Haq and Utley** operates fashion clothing concessions in several large department stores. A major London store is opening its first provincial branch and the company is currently negotiating terms for an in-store concession. There will be a substantial initial outlay on shop-fitting which the company must recoup within three years; after that time, under the terms of the draft agreement with the department store, Ul-Haq and Utley will be required to completely refurbish their space. The company has had a great deal of experience in this type of shop-fitting and is able to estimate to a high degree of accuracy the costs involved. The directors are, therefore, confident in their estimate of €89,000 for shop fitting. There will be additional advertising expenditure of €10,000 in the first year (to be treated as a cash flow arising at time 1). However, the cash inflows arising from the project are less easy to estimate. The directors have prepared two sets of figures – one optimistic and one pessimistic. They wish to appraise both sets of figures in order to be able to assess the impact of the worse-case scenario. Their net cash inflow projections are as follows:

Time	Optimistic scenario	Pessimistic scenario
	€	€
1	56,000	32,000
2	66,000	35,000
3	68,000	36,000

Required:

i) calculate the payback period for both scenarios

ii) calculate the NPV of both scenarios, using the company's cost of capital which is 8%

3. A company estimates the following net cash inflows and outflows for a capital investment project that is currently under consideration:

Time	€
0	(575,000)
1	45,800
2	99,000
3	104,300
4	118,700
5	130,400
6	129,000
7	116,500
8	77,200
9	55,000
10	12,500

The company's cost of capital is 8%.

a) calculate the NPV of the project

b) calculate the IRR of the project

4. **Vickery and Vojnovic** is a business partnership set up by Robin Vickery and Kaspar Vojnovic some years ago. The partners are now considering the installation of a new

computer system using specially written software to streamline the business's warehousing operations. The initial outlay on the project will be substantial. A feasibility study has already cost €20,000. Kaspar estimates that payments to the software house will be €100,000 immediately, with a further €75,000 in a year's time. New equipment and installation and testing costs will amount to €148,000 during the first year (it should be assumed for appraisal purposes that these costs arise at time 1). The plan is that the new system should go live in one year's time. After that point the business should start to reap considerable benefits from what will be, essentially, a paperless ordering and shipment tracking system. The partners plan to reduce their staffing levels considerably during the first two years during which the system is in operation and there will be other cost saving benefits including a reduction in office storage space, stationery, postage and other costs. Because of the increased efficiency of the operation, the partners also expect substantial increases in sales. The net cash inflows forecast from the installation of the new systems are as follows:

Time	€000
2	184
3	159
4	108
5	96
6	40

At the end of year six, the partners anticipate that the system will have to be scrapped and replaced with whatever is the latest technology at the time. There will be no residual value in the system at that point.

The partners have asked you to appraise the project to see how quickly it will pay back. You offer to appraise the project using discounted cash flow techniques, although Robin (who did a business course a few years ago) is distinctly sceptical about this approach: 'The good thing about payback is that you can see immediately how long it's going to take to recoup the cost of the investment. Discounted cash flow doesn't make any sense to me'. However, he agrees that it might just be helpful to see what the NPV of the project is, and he estimates the business's cost of capital at 11%.

Required

a) calculate the payback period for the project
b) calculate the NPV of the project using 11% as the discount rate
c) briefly set out the arguments in support of the point of view that discounted cash flow techniques are superior to payback as a method of investment appraisal

Chapter 7 Answers

1. The Tullane Biscuit Company

a) ARR calculation

Average expected return (accounting profit) x 100 = ARR%

Average capital employed

€135,000 – 10,000 (residual value) = €125,000 (depreciable amount). Over five years, this results in a straight line depreciation charge of €25,000 per year. This must be taken into account in calculating accounting profit.

Year	€000
1	35 – 25 = 10
2	47 – 25 = 22
3	52 – 25 = 27
4	55 – 25 = 30
5	55 – 25 = 30
Total profit	119

The average profit generated per year is:

$$\frac{119{,}000}{5} = €23{,}800$$

Average capital employed:

$$\frac{135{,}000 + 10{,}000}{2} = €72{,}500$$

$$\text{ARR} = \frac{23{,}800}{72{,}500} \times 100 = 32.8\%$$

b) Payback

Time	Cash flow €000	Cumulative cash flow €000
0	(135)	(135)
1	35	(100)
2	47	(53)
3	52	(1)
4	55	54
5	55	109

Cumulative cash flow reaches the zero position at almost exactly three years. Payback is three years.

2. Ul-Haq and Utley

a) Payback period

Time	Optimistic scenario		Pessimistic scenario	
	Cash inflow/(outflow)	Cumulative cash flow	Cash inflow/outflow	Cumulative cash flow
	€	€	€	€
0	(89,000)	(89,000)	(89,000)	(89,000)
1	56,000		32,000	
	(10,000)	(43,000)	(10,000)	(67,000)
2	66,000	23,000	35,000	(32,000)
3	68,000	91,000	36,000	4,000

Optimistic scenario: the project pays back at some point during the second year: payback to the nearest whole month is:

1 year + (43/66 x 12 months) = 1 year and 8 months

Pessimistic scenario: the project does not payback until nearly the end of the third year: payback to the nearest whole month is:

2 years + (32/36 x 12 months) = 2 years and 11 months

b) NPV calculations

Optimistic scenario:

Time	Cash flow €	Discount factor	Discounted cash flow €
0	(89,000)	1	(89,000)
1	56,000	0.926	51,856
1	(10,000)	0.926	(9,260)
2	66,000	0.857	56,562
3	68,000	0.794	53,992
Total			64,150

Pessimistic scenario:

Time	Cash flow €	Discount factor	Discounted cash flow €
0	(89,000)	1	(89,000)
1	32,000	0.926	29,632

1	(10,000)	0.926	(9,260)
2	35,000	0.857	29,995
3	36,000	0.794	28,584
Total			(10,049)

3. NPV at 8% cost of capital:

Time	Cash flow €	Discount factor (8%)	Discounted cash flow €
0	(575,000)	1	(575,000)
1	45,800	0.926	42,411
2	99,000	0.857	84,843
3	104,300	0.794	82,814
4	118,700	0.735	87,245
5	130,400	0.681	88,802
6	129,000	0.630	81,270
7	116,500	0.584	68,036
8	77,200	0.540	41,688
9	55,000	0.500	27,500
10	12,500	0.463	5,788
Total			35,397

c) IRR

8% cost of capital produces a positive NPV. The IRR (the point at which NPV = 0) must therefore be higher than this. Calculating NPV at 10%:

Time	Cash flow €	Discount factor (10%)	Discounted cash flow €
0	(575,000)	1	(575,000)
1	45,800	0.909	41,632
2	99,000	0.826	81,774
3	104,300	0.751	78,329
4	118,700	0.683	81,072
5	130,400	0.621	80,978
6	129,000	0.564	72,756
7	116,500	0.513	59,764
8	77,200	0.467	36,052
9	55,000	0.424	23,320
10	12,500	0.386	4,825
Total			(14,498)

IRR must, therefore, lie somewhere between 8% and 10%.

Using a discount rate of 8% NPV = €35 397

Using a discount rate of 10% NPV = €- 14 498

The total distance between these two figures is €35 397 + 14 498 = €49 895

The distance between 8% and IRR is:

€35,397 x 2% = 1.42%

49,895

IRR is 8% + 1.42% = 9.42%

4. Vickery and Vojnovic

a) Payback period

Time	Cash flows €000	Cumulative cash flows €000
0	(100)	(100)
1	(75)	(175)
1	(148)	(323)
2	184	(139)
3	159	20

4	108	128
5	96	224
6	40	264

Cumulative cash flow reaches the zero position some time during the third year. Payback to the nearest whole month is:

2 years + (139/159 x12 months) = 2 years 10 months

Note: the €20,000 spent on the feasibility study is regarded as a sunk cost; it is not taken into account in the appraisal.

b) NPV calculation

Time	Cash flows €	Discount factor (11%)	Discounted cash flow €
0	(100,000)	1	(100,000)
1	(75,000)	0.901	(67,575)
1	(148,000)	0.901	(133,348)
2	184,000	0.812	149,408
3	159,000	0.731	116,229
4	108,000	0.659	71,172

5	96,000	0.593	56,928
6	40,000	0.535	21,400
Total			114,214

c) Payback is a very straightforward investment appraisal technique which is popular because it is easy both to calculate and to understand. However, it emphasises just one single aspect of investment appraisal – the ability to pay back quickly. It ignores cash flows which arise after the point of payback and so does not look at the total cash flows expected to arise from the project. Discounted cash flow techniques address some of the limitations of payback. All cash flows are considered, and the time value of money (which is important) is also taken into account. In most cases relating to capital investment appraisal, business managers should employ more than one technique to assist them in reaching a decision.