Lecture 6: Exercises

12.11 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

Darwin uses decision tree analysis to evaluate potential projects. The company has been looking at the launch of a new product which it believes has a 70 per cent probability of success. The company is, however, considering undertaking an advertising campaign costing £50 000, which would increase the probability of success to 95 per cent. If successful, the product would generate income of £200 000 otherwise £70 000 would be received.

Required:

What is the maximum that the company would be prepared to pay for the advertising?

Suggested solution:

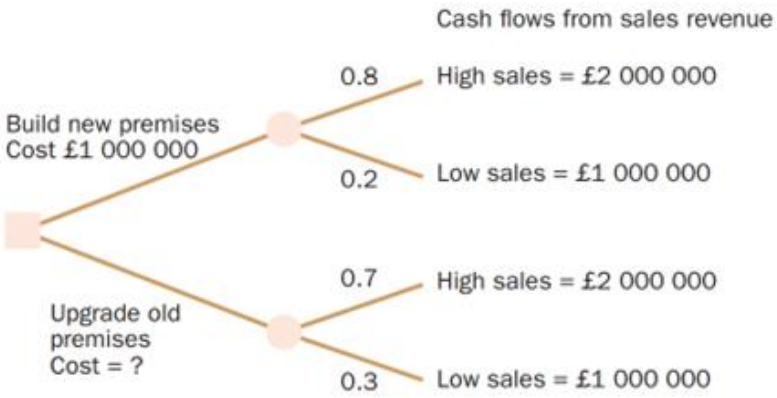
Expected income with advertising = (£200 000 x 0.95)+ (£70 000 x 0.05) = £ 193 500

Expected income without advertising = (£200 000 x 0.7) + (£70 000 x 0.3) = £ 161 000

The maximum amount the company should pay for advertising is the increase in expected value of £32 500.

12.12 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

A company uses decision tree analysis to evaluate potential options. The management accountant for the company has established the following:



Required:

What would be the cost of the upgrade that would make the company financially indifferent between building new premises and upgrading the old one?

Suggested solution:

Expected value of new building = (0.8 x £2 million) + (0.2 x £1 million) -£1 million = £0.8 million
Expected value of upgrade = (0.7 x £2 million) + (0.3 x £1 million) - upgrade (?) = £1.7 million – upgrade
Cost of upgrade to make the company financially indifferent =£0.9 million (1.7 - 0.8 million)

12.18 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

An events management company is trying to decide whether or not to advertise an outdoor concert. The sale of tickets is dependent on the weather. If the weather is poor it is expected that 5 000 tickets will be sold without advertising. There is a 70% chance that the weather will be poor. If the weather is good it is expected that 10 000 tickets will be sold without advertising. There is a 30% chance that the weather will be good. If the concert is advertised and the weather is poor, there is a 60% chance that the advertising will stimulate further demand and ticket sales will increase to 7 000. If the weather is good there is a 25% chance the advertising will stimulate demand and ticket sales will increase to 13 000.

The profit expected, before deducting the cost of advertising, at different levels of ticket sales are as follows:

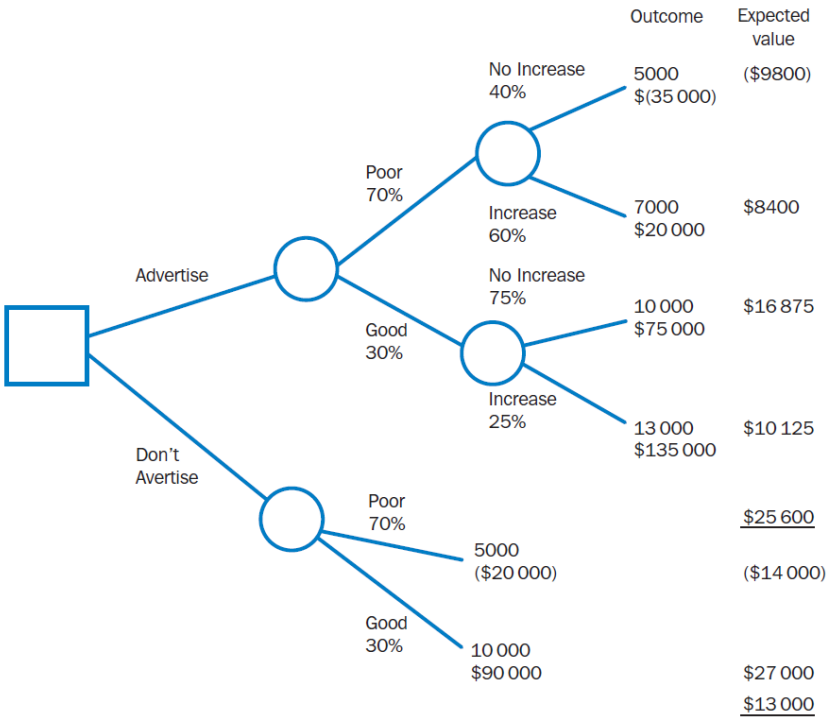
Number of tickets sold	Profit $
5 000	(20 000)
6 000	(5 000)
7 000	35 000
8 000	55 000
9 000	70 000
10 000	90 000
11 000	115 000
12 000	130 000
13 000	150 000

The cost of advertising the concert will be $15 000.

Required:

Demonstrate, using a decision tree, whether the concert should be advertised.

Suggested solution:



Note that the entries in the expected value column are calculated by multiplying the joint probability of the outcomes by the monetary value of the outcome. The joint probabilities of the 4 outcomes arising from the 'advertise option' are 0.28 (0.7 x 0.4), 0.42 (0.7 x 0.6), 0.225 (0.75 x 0.3) and 0.075 (0.3 x 0.25). Based on the expected value approach the concert should be advertised.

13.13 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

An investment has the following cash inflows and cash outflows:

Time	Cash flow per annum £000
0	(20 000)
1–4	3 000
5–8	7 000
10	(10 000)

Required:

What is the net present value of the investment at a discount rate of 8 per cent?

Suggested solution:

Time	Cash flow (£000)	Discount factor at 8%	Present value (£000)
0	(20 000)	1.0	(20 000)
1–4	3 000	3.312	9 936
5–8	7 000	2.435 (5.747 –3.312)	17 045
10	(10 000)	0.463	(4 630)
		NPV	2 351

13.21 Advanced: Relevant cash flows and calculation of NPV and IRR. (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

A car manufacturer has been experiencing financial difficulties over the past few years. Sales have reduced significantly as a result of the worldwide economic recession. Costs have increased due to quality issues that led to a recall of some models of its cars. Production volume last year was 50 000 cars and it is expected that this will increase by 4% per annum each year for the next five years. The company directors are concerned to improve profitability and are considering two potential investment projects.

Project 1 – implement a new quality control process.

The company has paid a consultant process engineer $50 000 to review the company's quality processes. The consultant recommended that the company implement a new quality control process. The new process will require a machine costing $20 000 000. The machine is expected to have a useful life of five years and no residual value.

It is estimated that raw material costs will be reduced by $62 per car and that both internal and external failure costs from quality failures will be reduced by 80%. Estimated internal and external failure costs per year without the new process, based on last year's production volume of 50 000 cars, and their associated probabilities are shown below:

Internal failure costs		External failure costs	
$	Probability	$	Probability
300 000	50%	1 300 000	60%
500 000	30%	1 900 000	30%
700 000	20%	3 000 000	10%

Internal and external failure costs are expected to increase each year in line with the number of cars produced. The company's accountant has calculated that this investment will result in a net present value (NPV) of $1 338 000 and an internal rate of return of 10.5%.

Project 2 – in-house component manufacturing

The company could invest in new machinery to enable in-house manufacturing of a component that is currently made by outside suppliers. The new machinery is expected to cost $15 000 000 and have a useful life of five years and no residual value. Additional working capital of $1 000 000 will also be required as a result of producing the component in-house.

The price paid to the current supplier is $370 per component. It is estimated that the in-house variable cost of production will be $260 per component. Each car requires one component Fixed production costs, including machinery depreciation, are estimated to increase by $5 000 000 per annum as a result of manufacturing the component in-house. Depreciation is calculated on a straight line basis.

Additional Information

The company is unable to raise enough capital to carry out both projects. The company will therefore have to choose between the two alternatives. Taxation and inflation should be ignored. The company uses a cost of capital of 8% per annum.

Required:

1. Calculate for Project 1 the relevant cash flows that the accountant should have used for year 1 when appraising the project. All workings should be shown in $000.
2. Calculate for Project 2 the net present value (NPV).

Suggested solution:

Project 1

Internal failure cost savings

Current expected value of savings ($000s) = ($300 x 0.5) + ($500 x 0.3) + ($700 x 0.2) = $440

Expected savings ($000s) in year 1 = $440 x 1.04 x 80% = $366.08

External failure cost savings

Current expected value of savings ($000s) = ($1 300 x 0.6) + ($1900 x 0.3) + ($3 000 x 0.1) = $1650

Expected savings ($000s) in year 1 = ($1 650 x 1.04 x $ 80%) = $1 372.8

Raw material cost future savings

Expected savings ($000s) in year 1 = 50 000 x $62 x 1.04 = $3 224

Net cash flows in year1

$366 080 + $1 372 800 + $3 224 000 = $4 962 880

Project 2 NPV

Expected savings in year 1 = $110 ($370 -$260) x 50 000 x $110 x 1.04 = $5 720 000

Additional annual fixed costs = $5m - $15m/5

depreciation = $2m

	Year 0 *$000*	*Year 1* *$000*	*Year 2* *$000*	*Year 3* *$000*	*Year 4* *$000*	*Year 5* *$000*
Initial Investment	(15 000)					
Working capital	(1 000)					1 000
Cost savings		5 720	5 949	6 187	6 434	6 691
Fixed costs		(2 000)	(2 000)	(2 000)	(2 000)	(2 000)
Net cash flows	(16 000)	3 720	3 949	4 187	4 434	5 691
Discount factor @ 8%	1 000	0.926	0.857	0.794	0.735	0.681
Present value	(16 000)	3 445	3 384	3 324	3 259	3 876

NPV = 1 288 000

Note that the cost savings increase at 4% per annum because of the increased production.

14.16 (Adopted by Drury, C. (2012). Management and cost accounting. Cengage Learning Hall, 8th eds.)

A company is considering investing in a manufacturing project that would have a three-year life span. The investment would involve an immediate cash outflow of £50 000 and have a zero residual value. In each of the three years, 4000 units would be produced and sold. The contribution per unit, based on current prices, is £5. The company has an annual cost of capital of 8 per cent. It is expected that the inflation rate will be 3 per cent in each of the next three years.

Required:

1. Calculate the net present value of the project (to the nearest £500)

Suggested solution:

It is assumed that the cost of capital is a nominal rate. The NPV can be calculated by discounting real cash flows at the real discount rate or nominal cash flows at the nominal discount rate. The real discount rate (1 + real discount rate) is (1 + nominal rate)/(1 + anticipated inflation rate) = 0.0485 (1.08/1.03 – 1). The annual cash flows in current prices are £20 000 (£5 x 4 000 units). NPV based on real cash flows and the real discount rate: (£20 000)/(1.0485) + (20 000)/$(1.0485)^2$ + (20 000)/ $(1.0485)^3$ – £50 000 = £4640 NPV based on discounting nominal cash flows at the nominal discount rate: (£20 000 x 1.03)/1.08 + (£20 000 x 1.03^2)/1.08^2 + (£20 000 x 1.03^3)/1.08^3 – £50 000 = £4640