

RISK MANAGEMENT AND DECISION TREE

Example 01

ABC Company produce and sells product X. The daily sales of the product may be as follows;

Sales Qty.	Probability
10,000	0.20
20,000	0.30
30,000	0.40
40,000	0.10
Total	1.00

You are required to compute the expected daily sales.

Example 02

Sumo Company manufacture and sells product P. The unit selling price of the product is Rs12/- and estimates of demand and variable costs are as follows;

Monthly Demand	Probability	Unit Variable Cost Rs	Probability
150,000	0.30	6	0.10
200,000	0.60	7	0.30
240,000	0.10	8	0.50
		9	0.10
Total	1.00		1.00

The unit variable costs do not depends on the volumes of sales. Monthly fixed cost will be Rs500,000/-.

You are required to calculate the expected profit.

Example 3

A manager has to choose between mutually exclusive options C and D and the probable outcome of each options are as follows.

Option C		Option D	
Cost	Probability	Cost	Probability
15,000	0.29	14,000	0.03
20,000	0.54	17,000	0.30
30,000	0.17	21,000	0.35
		24,000	0.32
Total	1.00		1.00

Both option will produce an income of Rs30,000. **Which should be chosen?**

Example 4

IRD PLC has to decide which of three mutually exclusive projects to undertake. The directors believe that success of the project will depend on the consumer reaction. There is a 25% chance that the consumer reaction will be strong, a 40% chance that consumer reaction will be good and a 35% chance that consumer reaction will be weak.

The company uses expected value to make this type of decisions. The net present value for each of possible outcome is as follows;

Consumer Reaction	Project K RsMn	Project L RsMn	Project M RsMn
Strong	10.00	16.00	12.00
Good	2.50	3.00	3.75
Weak	2.00	1.40	1.00

The market research company believes that it can provide perfect information on consumer reaction.

You are required to calculate the maximum amount that should be paid for the information from the market research company.

Example 06

Paramount Company is evaluating whether to develop and launch a new product. Research and development cost are expected to be Rs600,000/- and there is a 75% of chance that the product launch will be successful and a 25% chance that it will fail. If it is successful, the level of expected profit and the probability of each occurring have been estimated as follows; depending on the product's popularity is high, medium or low.

Product Popularity	Probability	Profit Rs
High	0.2	600,000
Medium	0.5	500,000
Low	0.3	400,000
Total	1	

The above profit is are for one year and it will last for 2 years.

If it is failure there is 0.6 probability that the research and development work can be sold for Rs60,000 and a 0.4 probability that it will be worth nothing at all.

You are required to

- Draw a decision tree
- Evaluate the decision

Example 07

TomTom PLC has a new product. At the moment, the company has two courses of action open to it, to test market the product or abandon it.

If company test market, the cost will be Rs1Mn and the market response could be positive or negative with probabilities of 0.6 and 0.4. If the response it positive, the company could either abandon the product or market it full scale.

If it markets the full scale, the outcome might be low, medium or high demand and the respective net gains / (losses) would be (200), 200 or 1,000 in units of Rs10,000 (the result could range from a net loss of Rs2Mn to gain of Rs10Mn). These outcome have probabilities of 0.20, 0.50, and 0.30 respectively.

If the result of test marketing is negative and the company goes ahead and the markets the product, the estimated loss would be Rs6Mn.

If at any point, the company abandons the product, there would be a net gain of Rs500,000 from the scale of scrap. All the financial values have been discounted to present.

You are required to;

- Draw a decision tree
- Evaluate the decision

Example 08

USP University is trying to decide whether or not to advertise a new post graduate degree program.

The number of students starting the program is dependent of economic conditions. If conditions are poor, it is expected that program will attract 40 students without advertising. There is 60% chance that economic condition will be poor. If economic conditions are good, it is expected that the program will attract only 20 students without advertising. There is a 40% chance that economic condition will be good.

If the program is advertised and economic conditions are poor, there is 65% chance that the advertising will stimulate further demand and the student number will increase to 50. If the economic conditions are good, there is a 25% chance the advertising will stimulate further demand and numbers will increase to 25 students.

The profit expected before deducting the cost of advertising at different levels of student numbers are as follows.

No. of Students	Profit (Rs000)
15	(100)
20	150
25	400
30	650
35	900
40	1,150
45	1,400
50	1,650

The cost of advertising the program will be Rs150,000/-.

You are required to;

- State 3 advantages of using decision tree
- Draw a decision Tree
- Evaluate the decision tree and advise the management.

Exercise 09

Kenny LTD is considering a project. The most likely cash flows associated with the project are as follows;

Year	Investment Rs.Mn	Sales RsMn	Variable Cost Rs. Mn
0	(7,000)		
1		6,500	(2,000)
2		6,500	(2,000)

The cost of capital is 8%.

You are required to;

Calculate the increase/decrease in each of the variables affecting the project's NPV at which Kenny LTD would be indifferent between accepting or rejecting the project.

Exercise 10

K Co is considering a project with the following cash flows.

Year	Initial investment	Sales	Variable cost	Tax	Net cash flows
0	(7,000.00)				(7,000.00)
1		7,800.00	(2,000.00)	(1,450.00)	4,350.00
2		7,800.00	(2,000.00)	(1,450.00)	4,350.00

Cash flows arise from selling 650,000 units at Rs. 12,000 per unit. K Co has a cost of capital of 8%. The tax rate is 25% with tax being payable in the year the cash flows occur.

Required

Assess the sensitivity of the project to changes in variables.

Exercise 11

NU Co has a cost of capital of 8% and is considering a project with the following 'most-likely' cash flows.

Year	Purchase of plant	Savings	Running cost	Net cash flows
0	(7,000.00)			(7,000.00)
1		6,000.00	(2,000.00)	4,000.00
2		7,000.00	(2,500.00)	4,500.00

Required

Calculate the sensitivity (in percentages) of the project to changes in the levels of expected costs and savings.

Exercise 12

DA Co, whose cost of capital is 10%, is considering a project with the following expected cash flows.

Year	Cash flows Rs.000	DF @ 10%	Present Value
0	(10,000.00)	1.00	(10,000.00)
1	7,000.00	0.91	6,363.00
2	5,000.00	0.83	4,130.00
3	5,000.00	0.75	3,755.00
		NPV +	4,248.00

The project seems to be worthwhile. However, because of the uncertainty about the future cash receipts, the management decides to reduce them to 'certainty-equivalents' by taking only 70%, 60% and 50% of the years 1, 2 and 3 cash flows respectively. The risk-free rate is 5%.

Required

On the basis of the information set out above, assess whether the project is worthwhile.

Question 01

Mega Development Builders (Pvt) Ltd (MDB) is a large scale infrastructure development company with a reputation for delivering quality output. With the launch of the Megapolis concept, MDB has envisaged opportunities for large scale infrastructure projects.

The government has lined up two large projects, EXE and WYE, which MDB is interested in. The request for proposal (RFP) has been issued for EXE. The RFP for WYE will be issued later, after appointing the contractor for project EXE. Based on past practice in relation to government tenders, MDB is aware that if it could secure project EXE, there is a better chance of securing project WYE.

The quantity surveyors of MDB have come up with the initial estimates for EXE with normal prices, according to which the suggested contract value is Rs. 2,000 million with a net profit margin of 15%. Per information available, the estimated value of project WYE is Rs. 3,000 million. If MDB can secure EXE, then with the experience of that project it can earn a net profit margin of 20% on WYE and otherwise it will be 15%.

The management of MDB is of the view that if they quote Rs. 2,000 million for EXE, the chance of winning the project is 60%, whereas if the quoted price is reduced by 10%, the chance of winning the project would increase to 80%. In the event MDB quotes the lower price it will undertake a rigorous cost saving plan by which it intends to reduce the total cost of the project by Rs. 100 million.

If MDB wins project EXE, it will not consider any price reduction when bidding for project WYE. The probability of MDB winning both projects in that event is 48%. However if MDB fails to win project EXE it has an option to consider a price reduction of 10% for project WYE, enhancing its chance of winning the project to 50% which would otherwise have been 40%. In the case of project WYE, there is no possibility of any cost saving.

Required:

(a) **Assess** the following probabilities:

- (i) The probability of winning the project WYE after winning EXE, having quoted EXE at the normal price
- (ii) The probability of losing the project WYE after winning EXE, having quoted EXE at the normal price
- (iii) The probability of winning the project WYE after winning EXE, having quoted EXE at the reduced price
- (iv) The probability of losing the project WYE after winning EXE, having quoted EXE at the reduced price (4 marks)

(b) **Outline** the options available for MDB in a decision tree, clearly showing the decisions to be made, outcomes and related probabilities. (11 marks)

(c) **Recommend** the best course of action for MDB in quoting for projects EXE and WYE.
 (Hint: Evaluate the decision tree based on expected values using the backward evaluation method) (10 marks) **(Total: 25 marks)**

Question 02

Public Transport Company (PTC) is contemplating to establish a luxury transport bus service in Sri Lanka. In the first phase it plans to set up a central bus terminal in a Colombo Suburb and deploy luxury buses on identified routes.

PTC acquired a property in a Colombo suburb at a price of Rs. 380 million. It also incurred Rs. 25 million to develop it, in addition to legal costs and survey charges of Rs. 5 million. The property, if necessary, can be sold now at Rs. 450 million.

An immediate investment of Rs. 200 million is required to acquire the buses. The table below shows the anticipated performance during the first two years of operation.

Performance during the 01st two years	Annual cash profit Rs.Mn	Probability
High	300.00	0.4
Low	100.00	0.6

The company could yield higher returns if it invests Rs. 200 million to upgrade the fleet and the terminal with enhanced facilities at the end of the second year. If this investment is made the anticipated performance from Year 3 to Year 5 is given in the table below.

If performance during the first two years	Performance Y3 to Y5	Annual cash profit Rs.Mn	Probability
High	High	400	0.4
	Low	150	0.6
Low	High	300	0.6
	Low	100	0.4

If the company does not invest in the upgrade at the end of the second year, the performance from Year 3 to Year 5 will be as given in the table below.

If performance during the first two years	Performance Y3 to Y5	Annual cash profit Rs.Mn	Probability
High	High	300	0.5
	Low	100	0.5
Low	High	250	0.5
	Low	50	0.5

The property will have a market value of Rs. 500 million at the end of five years. At the end of five years, the buses purchased now could be disposed for a total of Rs. 20 million and those purchased at the end of the second year could be disposed for a total of Rs. 50 million. This project would also qualify for a tax holiday of 10 years.

PTC's cost of capital is 14%. The discount factors at 14% are given in the table below.

Year	1	2	3	4	5	6
DF @ 14%	0.877	0.769	0.675	0.592	0.519	0.456

Required:

- (i) **Draw** a decision tree diagram for the problem. (6 marks)
- (ii) **Assess** the options available in the above decision tree in a manner that would help the management to decide on the best course of action. (12 marks)
- (iii) **State** the best course of action the company could take with regard to the setting up of the luxury transport bus service and subsequent upgrading. (2 marks)

