

***ADVANCED CAPITAL
BUDGETING DECISIONS***

CLASS 10-HW-Q24

Topic Risk analysis - Statistical Techniques

Probability Tree

Question 24:

XY Ltd. has under its consideration a project with an initial investment of ₹ 1,00,000. Three probable cash inflow scenarios with their probabilities of occurrence have been estimated as below:

Annual cash inflow (₹)	20,000	30,000	40,000
Probability	0.1	0.7	0.2

The project life is 5 years and the desired rate of return is 20%. The estimated terminal values for the project assets under the three probability alternatives, respectively, are ₹ 0, 20,000 and 30,000.

You are required to:

- Find the probable NPV;
- Find the worst-case NPV and the best-case NPV; and
- State the probability occurrence of the worst case, if the cash flows are perfectly positively correlated over time.

(Source: ICAI)

ANSWER:

The expected cash flows of the project are as follows:

Year	Pr = 0.1	Pr = 0.7	Pr = 0.2	Total
	₹	₹	₹	₹
0	-10,000	-70,000	-20,000	-1,00,000
1	2,000	21,000	8,000	31,000
2	2,000	21,000	8,000	31,000
3	2,000	21,000	8,000	31,000
4	2,000	21,000	8,000	31,000
5	2,000	21,000	8,000	31,000
5	0	14,000	6,000	20,000

- NPV based on expected cash flows would be as follows:

$$\begin{aligned}
 &= -₹ 1,00,000 + \frac{₹ 31,000}{(1+0.20)^1} + \frac{₹ 31,000}{(1+0.20)^2} + \frac{₹ 31,000}{(1+0.20)^3} + \frac{₹ 31,000}{(1+0.20)^4} + \frac{₹ 31,000}{(1+0.20)^5} + \frac{₹ 20,000}{(1+0.20)^5} \\
 &= - ₹ 1,00,000 + ₹ 25,833.33 + ₹ 21,527.78 + ₹ 17,939.81 + ₹ 14,949.85 + ₹ 12,458.20 + ₹ 8,037.55
 \end{aligned}$$

$$NPV = ₹ 746.52$$

- ii. For the worst case, the cash flows from the cash flow column farthest on the left are used to calculate NPV

$$= - ₹ 100,000 + \frac{₹ 20,000}{(1+0.20)^1} + \frac{₹ 20,000}{(1+0.20)^2} + \frac{₹ 20,000}{(1+0.20)^3} + \frac{₹ 20,000}{(1+0.20)^4} + \frac{₹ 20,000}{(1+0.20)^5}$$

$$= - ₹ 100,000 + ₹ 16,666.67 + ₹ 13,888.89 + ₹ 11,574.07 + ₹ 9,645.06 + ₹ 8037.76$$

$$NPV = - ₹ 40,187.76$$

For the best case, the cash flows from the cash flow column farthest on the right are used to calculate NPV

$$= - ₹ 100,000 + \frac{₹ 40,000}{(1+0.20)^1} + \frac{₹ 40,000}{(1+0.20)^2} + \frac{₹ 40,000}{(1+0.20)^3} + \frac{₹ 40,000}{(1+0.20)^4} + \frac{₹ 40,000}{(1+0.20)^5} + \frac{₹ 30,000}{(1+0.20)^5}$$

$$= - ₹ 1,00,000 + ₹ 33,333.33 + ₹ 27,777.78 + ₹ 23,148.15 + ₹ 19,290.12 + ₹ 16,075.10 + ₹ 12,056.33$$

$$NPV = ₹ 31,680.81$$

- iii. If the cash flows are perfectly dependent, then the low cash flow in the first year will mean a low cash flow in every year. Thus, the possibility of the worst case occurring is the probability of getting ₹ 20,000 net cash flow in year 1 is 10%.