

***ADVANCED CAPITAL
BUDGETING DECISIONS***

CLASS 9-HW-Q21

Topic Conceptual Sums

Question 21:

Raman Industries Ltd. is evaluating two projects: A and B. The estimates made by the analyst of the company regarding the initial investment required for the projects is Rs.5 crore for project A and Rs.7 crore for project B. The cash flow estimates for the projects are as follows:

Project A			Project B	
Year	Cash flow (Rs. Crore)	Probability	Cash flow (Rs. Crore)	Probability
1	2.00	0.25	2.75	0.30
	2.25	0.50	3.25	0.40
	2.50	0.25	4.25	0.30
2.	3.25	0.20	5.50	0.15
	4.50	0.60	6.75	0.60
	6.00	0.20	8.25	0.25
3	2.75	0.15	3.25	0.20
	3.75	0.50	4.50	0.40
	4.50	0.35	5.00	0.40

The cost of capital of the company is 20% and the risk free rate of discount is 7%.

You are required to

- Calculate the net present value (NPV) of the two projects.
- Standard deviation of the NPV if the cash flows of the projects are:
 - Perfectly correlated
 - Uncorrelated

(Source: FOD)

ANSWER:

The expected values of the cash flows of the projects are as follows:

Year	Project A	Project B
1	$2 \times 0.25 + 2.25 \times 0.50 + 2.50 \times 0.25 = 2.25$	$2.75 \times 0.30 + 3.25 \times 0.40 + 4.25 \times 0.30 = 3.40$
2	$3.25 \times 0.20 + 4.50 \times 0.60 + 6.00 \times 0.20 = 4.55$	$5.50 \times 0.15 + 6.75 \times 0.60 + 8.25 \times 0.25 = 6.94$
3	$2.75 \times 0.15 + 3.75 \times 0.50 + 4.50 \times 0.35 = 3.86$	$3.25 \times 0.20 + 4.50 \times 0.40 + 5.00 \times 0.40 = 4.45$

The standard deviations of the cash flows of the projects are as follows:

Year	Project A	Project B
1	$\{(2-2.25)^2 \times 0.25 + (2.25-2.25)^2 \times 0.50 + (2.50-2.25)^2 \times 0.25\}^{1/2} = 0.18$	$\{(2.75-3.40)^2 \times 0.30 + (3.25-3.40)^2 \times 0.40 + (4.25-3.40)^2 \times 0.30\}^{1/2} = 0.59$
2	$\{(3.25-4.55)^2 \times 0.20 + (4.50-4.55)^2 \times 0.60 + (6.00-4.55)^2 \times 0.20\}^{1/2} = 0.87$	$\{(5.50-6.94)^2 \times 0.15 + (6.75-6.94)^2 \times 0.60 + (8.25-6.94)^2 \times 0.25\}^{1/2} = 0.87$
3	$\{(2.75-3.86)^2 \times 0.15 + (3.75-3.86)^2 \times 0.50 + (4.50-3.86)^2 \times 0.35\}^{1/2} = 0.58$	$\{(3.25-4.45)^2 \times 0.20 + (4.50-4.45)^2 \times 0.40 + (5.00-4.45)^2 \times 0.40\}^{1/2} = 0.64$

a. Net present value of project A = $-5 + \frac{2.25}{1.07} + \frac{4.55}{1.07^2} + \frac{3.86}{1.07^3} = 4.23$

Net present value of project B = $-7 + \frac{3.40}{1.07} + \frac{6.94}{1.07^2} + \frac{4.45}{1.07^3} = 5.87$

b. Standard deviation of NPV of project A if cashflows are perfectly correlated

$$= \frac{0.18}{1.07} + \frac{0.87}{1.07^2} + \frac{0.58}{1.07^3} = 1.40$$

Standard deviation of NPV of project A if cash flows are uncorrelated

$$= \left(\frac{0.18^2}{1.07^2} + \frac{0.87^2}{1.07^4} + \frac{0.58^2}{1.07^6} \right)^{1/2} = 0.91$$

Standard deviation of NPV of project B if cash flows are perfectly correlated

$$= \frac{0.59}{1.07} + \frac{0.87}{1.07^2} + \frac{0.64}{1.07^3} = 1.83$$

Standard deviation of NPV of project B if cash flows are uncorrelated

$$= \left(\frac{0.59^2}{1.07^2} + \frac{0.87^2}{1.07^4} + \frac{0.64^2}{1.07^6} \right)^{1/2} = 1.07$$