ADVANCED CAPITAL BUDGETING DECISIONS

CLASS 4

Topic Sensitivity Analysis

Question 1:

XYZ Ltd. is considering a project for which the following estimates are available:

	₹
Initial Cost of the project	10,00,000
Sales price/unit	60
Cost/unit	40
Sales volumes	
Year 1	20000 units
Year 2	30000 units
Year 3	30000 units

Discount rate is 10% p.a.

You are required to measure the sensitivity of the project in relation to each of the following parameters:

a. Sales Price/unit
b. Unit cost
c. Sales volume
d. Initial outlay and
e. Project lifetime

Taxation may be ignored.

(Source: ICAI)

ANSWER:

Calculation of NPV

$$\text{NPV} = -10,00,000 + \frac{20,000\times 20}{1.1} + \frac{30,000\times 20}{1.21} + \frac{30,000\times 20}{1.331}$$

$$= -10,00,000 + 3,63,636 + 4,95,868 + 4,50,789$$

$$= 13,10,293 - 10,00,000$$

$$= ₹3,10,293/-.$$

Measurement of sensitivity is as follows:

a. Sales Price:

Let the sale price/Unit be S so that the project would break even with 0 NPV.

$$\therefore 10,00,000 = \frac{20,000\times(S-40)}{1.1} + \frac{30,000\times(S-40)}{1.21} + \frac{30,000(S-40)}{1.331}$$

$S - 40 = 10,00,000/65,514$

$S - 40 = ₹\ 15.26$

S = ₹ 55.26 which represents a fall of (60-55.26)/60
Or 0.079 or 7.9%

Alternative Method

$$\frac{10,00,000 \times 20}{13,10,293} = ₹15.26$$

S = ₹ 40 + ₹ 15.26
= ₹ 55.26

Alternative Solution

If sale Price decreased by say 10%, then NPV (at Sale Price of ₹ 60 – ₹ 6 = ₹ 54)

$$NPV = -10,00,000 + \frac{20,000 \times 14}{(1.1)^1} + \frac{30,000 \times 14}{(1.1)^2} + \frac{30,000 \times 14}{(1.1)^3}$$

= -10,00,000 +2,54,545 + 3,47,107 + 3,15,552
= -82,796

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (-82,796)}{3,10,293} \times 100 = 126.68\%$$

b. Unit Cost:

If sales price = ₹ 60 the cost price required to give a margin of ₹ 15.26 is (₹ 60 – ₹ 15.26) or ₹ 44.74 which would represent a rise of 11.85% i.e., $\left(\frac{44.74 - 40}{40} \times 100\right)$

Alternative Solution

If unit cost increased by say 10%. The new NPV will be as follows:

$$NPV = -10,00,000 + \frac{20,000 \times 16}{(1.1)^1} + \frac{30,000 \times 16}{(1.1)^2} + \frac{30,000 \times 16}{(1.1)^3}$$

= -10,00,000 + 2,90,909 + 3,96,694 + 3,60,631
= 48,234

$$\text{NPV decrease (\%)} = \frac{3,10,293 - (48,234)}{3,10,293} \times 100 = 84.46\%$$

c. Sales volume:

The requisite percentage fall is:
3,10,293/13,10,293 × 100 = 23.68%

Alternative Solution

If sale volume decreased by say 10%. The new NPV will be as follows:

$$NPV = -10,00,000 + \frac{18,000 \times 20}{(1.1)^1} + \frac{27,000 \times 20}{(1.1)^2} + \frac{27,000 \times 20}{(1.1)^3}$$

= -10,00,000 + 3,27,272 + 4,46,281 + 4,05,710
= 1,79,263

NPV decrease (%) = $\frac{3,10,293 - 1,79,263}{3,10,293} \times 100 = 42.22\%$

d. Since PV of inflows remains at ₹13,10,293 the initial outlay must also be the same.

$\therefore$ Percentage rise = 3,10,293/10,00,000 $\times$ 100 = 31.03%.

Alternative Solution

If initial outlay increased by say 10%. The new NPV will be as follows:

NPV = -11,00,000 + $\frac{20,000 \times 20}{(1.1)^1} + \frac{30,000 \times 20}{(1.1)^2} + \frac{30,000 \times 20}{(1.1)^3}$

= -11,00,000 + 3,63,636 + 4,95,868 + 4,50,789
= 2,10,293

NPV decrease (%) = $\frac{3,10,293 - 2,10,293}{3,10,293} \times 100 = 32.22\%$

e. Present value for 1st two years.

= - 10,00,000 + 4,00,000 x 0.909 + 6,00,000 x 0.826
= - 10,00,000 + 3,63,600 + 4,95,600
= - 10,00,000 + 8,59,200
= - 1,40,800

$\therefore$The project needs to run for some part of the third year so that the present value of return is ₹ 1,40,800. It can be computed as follows:

i. 30,000 units × ₹ 20 x 0.751 = ₹ 4,50,600

ii. Per day Production in (₹) assuming a year of 360 days = $\frac{₹4,50,600}{360} = ₹1,252$

iii. Days needed to recover ₹1,40,800 = $\frac{₹1,40,800}{₹1,252} = 112$

Thus, if the project runs for 2 years and 112 days then break even would be achieved representing a fall of $\frac{(3 - 2.311)}{3} \times 100 = 22.97\%$