

***ADVANCED CAPITAL
BUDGETING DECISIONS***

CLASS 4-HW-Q8

Topic Sensitivity Analysis

Question 8:

The following information applies to a new project:

Initial Investment	₹ 125,000
Selling price per Unit	₹ 100
Variable costs per unit	₹ 30
Fixed costs for the period	₹ 100,000
Sales volume	2,000 units
Life	5
Discount rate	10%

Required: Project's NPV and show how sensitive the results are to various input factors.

(Source: ICAI)

ANSWER:

$$NPV = -125,000 + [(100 - 30) 2,000 - 100,000] \times 3.791 = ₹ 26,640$$

Sensitivity to changes to

1. Selling price

$125,000 = [(P - 30) 2,000 - 100,000] \times 3.791$	Alternatively
$32,973 = 2,000P - 60,000 - 100,000$	₹ 26,640
$P = 96.49$	$2,000 \times ₹ 100 \times 3.791$

i.e. fall of 3.51% $\left(\frac{96.49 - 100}{100} \right)$ before NPV is zero

2. Variable costs

$125,000 = [(100 - v) 2,000 - 100,000] \times 3.791$	Alternatively
$32,973 = 200,000 - 2000V - 100,000$	₹ 26,640
$V = 33.51$	$2,000 \times ₹ 30 \times 3.791$

i.e. increase of 11.71% $\left(\frac{33.51 - 30}{30} \right)$ before NPV is zero

3. Volume

$125,000 = [(100 - 30) q - 100,000] \times 3.791$	Alternatively
$32,973 = 70q - 100,000$	₹ 26,640
$q = 1,900$	$2,000 \times ₹(100 - 30) \times 3.791$

in fall of 5.0% $\left(\frac{1900 - 2000}{2000} \right)$ before NPV is zero

4. Initial cost

	Alternatively
₹ (125,000 + 26,640) = ₹ 151,640	₹ 26,640
	₹ 125,000

i.e. increase of 21.31% $\left(\frac{151640 - 125000}{125000} \right)$ before NPV is zero

5. Fixed costs

125,000 = [(₹ 100 – ₹ 30) 2,000 - F] X 3.791	Alternatively
32,973 = 140,000 – F	₹ 26,640
F = 107,027	₹ 100,000 x 3.791

i.e. an increase of 7.03% $\frac{(107027 - 100000)}{100000}$ before NPV is zero

6. Life

₹125,000 = ₹ 40,000 x AF_n @ 10%

3.125 = AF_n @ 10%

AF for 4 years at 10% is 3.17

i.e. life can fall to approximately 4 years before NPV is zero.

7. Discount rate

3.125 = AF for 5 years @ x %

From tables AF for 5 year @ 18% is 3.127, so x is approximately 18%

i.e. an increase of 80% $\left(\frac{18\% - 10\%}{10\%} \right)$ before NPV is zero

ALTERNATIVE SOLUTION

HW. Q.
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Selling Price p.u.	100
(-) V.C. p.u.	(30)
Contribution p.u.	70
Sales volume	2000 units
Contribution	140000
(-) F.C.	(100000)
CFAT	40000

$$\begin{aligned}
 NPV &= 40000 \times PVAF(10\%, 5) - 125000 \\
 &= 40000 \times 3.791 - 125000 \\
 &= 151640 - 125000 \\
 &= 26640
 \end{aligned}$$

Method 1 : Margin of safety Approach -

i) Selling price -

$$[(P - 30) \times 2000 - 100000] \times 3.791 - 125000 = 0$$

$$\uparrow$$

$$100 - \text{status} \rightarrow 100 \times 2000 \times 3.791 = 758200$$

$$NPV / \text{status} \times 100$$

$$\therefore MOS = \frac{26640}{758200} \times 100 = 3.51\%$$

2) Variable costs :-

$$(\text{status} \rightarrow 30 \times 2000 \times 3.791 = 227460)$$

$$\therefore \text{MOS} = \frac{26640}{227460} \times 100 = 11.71\%$$

3) Sales Volume :-

$$(\text{status} \rightarrow 2000 (100 - 30) \times 3.791 = 530740)$$

$$\therefore \text{MOS} = \frac{26640}{530740} \times 100 = 5.01\%$$

4) Initial Cost :-

$$\text{MOS} = \frac{26640}{125000} \times 100 = 21.31\%$$

5) Fixed Cost :-

$$\text{MOS} = \frac{26640}{100000 \times 3.791} \times 100 = 7.03\%$$

6) Life :- $n = 5 \rightarrow \text{NPV} = 26640$

$$n = 4 \rightarrow \text{NPV} = 40000 \times 3.17 - 125000 = 1800$$

$$n = ? \rightarrow \text{NPV} = 0 \rightarrow \text{Breakeven}$$

$$\frac{n-4}{5-4} = \frac{0-1800}{26640-1800} \Rightarrow n-4 = -0.0725$$

$$\therefore n = 3.9275 \approx 4 \text{ years}$$

7) Discount rate :-

$$\text{at } r = 10\%, \text{ NPV} = 26640$$

Lets consider $r = 15\%$

$$\text{NPV} = 40000 \times \text{PVAF}(15\%, 5) - 125000$$

$$= 40000 \times 3.359 - 125000$$

$$= 134360 - 125000$$

$$= 9360$$

$$\begin{aligned}
 \text{Required rate} = \text{IRR} &= 10 + \frac{26640}{26640 - 9360} \times (15 - 10) \\
 &= 10 + \frac{133200}{17280} \\
 &= 17.708 \\
 &\approx 18\%
 \end{aligned}$$

$$\therefore \text{MOS} = \frac{18 - 10}{10} \times 100 = 80\%$$