

* Capital Budgeting Techniques / Propasal Appraisal Techniques

→ Pay - Back Period.

Initial Investment (Yr. 0)

- 10,00,000

Yr. 1
1,00,000)

Yr. 2
4,00,000)

Yr. 3
3,00,000)

Yr. 4
3,00,000 → 11,00,000

Yr. 5
3,00,000

P.B. Period = 4 yrs.

→ Discounted Pay - Back Period

Initial Outlay Yr. 0

- 10,00,000

1,00,000 X

Yr. 1
4,00,000

Yr. 2
3,00,000

Yr. 3
3,00,000

Yr. 4
3,00,000

Yr. 5
3,00,000

PVIF

C.F

✓

✓

✓

✓

✓

DPBP

1.(a) Pay Back Period

Yrs.	CFAT	Cumulative CF.	
0	-330		
1	90	90	
2	120	210	
3	380	590	
4	420	1,010	C.F. Remaining
5	310	1,320	
6	240	1,560	C.F. Recd. in <u>3rd yr</u>
7	60	1,620	120 lakkh 380 lakkh.

$$\text{Pay-Back Period} = 2 \text{ yrs} + \frac{\text{C.F. Remaining}}{\text{C.F. Recd. in } n^{\text{th}} \text{ yrs}}$$

$$= 2 \text{ yrs} + \frac{120}{380}$$

$$= 2 + 0.32$$

$$\therefore \text{Pay-Back Period} = \boxed{2.32 \text{ years}}$$

1.(b) Discounted Pay-back Period

Yrs.	CFAT	P.V. Factor @ 15%	P.V. of CF Discounted C.F.	Cumulative C.F.
0	-330	1		
1	90	0.870	78.3	78.3
2	120	0.756	90.72	169.02
3	380	0.658	250.04	419.06
4	420	0.572	240.24	659.30
5	310	0.497	154.07	813.37
6	240	0.432	103.68	917.05
7	60	0.376	22.56	939.61

C.F. Recd. by the end of Yr. 2 = 169.02

C.F. Remaining = 160.98

C.F. Recd. in 3rd yr. 250.04

$$\text{Discounted Pay-Back Period} = 2 + \frac{160.98}{250.04}$$

$$= 2 + 0.64$$

$$\rightarrow = \boxed{2.64} \text{ Years}$$

* Net Present Value (NPV)

$NPV = P.V. \text{ of Cash Inflows} - P.V. \text{ of Cash Outflows}$
(outlay / Initial Investment)

If NPV is Positive, Accept the Project.

If NPV is Negative, Reject the Project.

* Profitability Index (PI)

$$PI = \frac{P.V. \text{ of Cash Inflows}}{P.V. \text{ of Cash Outflows}}$$

Decision Criteria.

If $PI > 1$, Accept.

If $PI < 1$, Reject.

3. Initial Investment = 10,00,000

Yr.	CFAT	P.V.F@12%	P.V. of CF.	Cumulative C.F.
1	1,50,000	0.893	1,33,950	1,33,950
2	2,00,000	0.797	1,59,400	2,93,350
3	3,00,000	0.712	2,13,600	5,06,950
4	4,50,000	0.636	2,86,200	7,93,150
5	5,00,000	0.567	2,83,500	10,76,650
6	4,00,000	0.507	2,02,800	12,79,450

a) Discounted Pay-Back Period

C.F. Recd. till 4th yr → 7,93,150
 C.F. Remaining = 2,06,850
 C.F. during 5th yr = 2,83,500

$$\text{Disc. Payback Period} = 4 + \frac{2,06,850}{2,83,500}$$

$$= 4 + 0.73$$

$$= \boxed{4.73 \text{ yrs.}}$$

12,79,450 ←
 b) Net Present Value

$$\text{NPV} = \text{P.V. of Cash Inflows} - \text{P.V. of Cash Outflows}$$

$$= 12,79,450 - (10,00,000)$$

2,79,450 NPV
Accept the project.

(c) Profitability Index

$$\text{PI} = \frac{\text{P.V. of Cash Inflows}}{\text{P.V. of Cash Outflows}}$$

$$= \frac{12,79,450}{10,00,000}$$

$$\text{PI} = 1.279 > 1$$

Accept the Project.

3. Initial Investment = 10,00,000

Yr.	CFAT	P.V.F@12%	P.V. of CF.	Cumulative C.F.
1	1,50,000	0.893	1,33,950	1,33,950
2	2,00,000	0.797	1,59,400	2,93,350
3	3,00,000	0.712	2,13,600	5,06,950
4	4,50,000	0.636	2,86,200	7,93,150
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a) Discounted Pay-Back Period

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$$= 4 + 0.73$$

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12,79,450 ←
 b) Net Present Value

$$\text{NPV} = \text{P.V. of Cash Inflows} - \text{P.V. of Cash Outflows}$$

$$= 12,79,450 - (10,00,000)$$

2,79,450 NPV
Accept the project.

(c) Profitability Index

$$\text{PI} = \frac{\text{P.V. of Cash Inflows}}{\text{P.V. of Cash Outflows}}$$

$$= \frac{12,79,450}{10,00,000}$$

$$\text{PI} = 1.279 > 1$$

Accept the Project.

* Internal Rate of Return (IRR)

Step-1 Average Cash Flow = $\frac{\text{Total Cash Flow}}{\text{No. of years}}$

Step-2 $\frac{\text{Initial Investment}}{\text{Avg. Cash Flow}} = \frac{1}{\text{PVIFA}}$

Step-3 Check the answer of Step-2 in PVIFA Table for n years, The Rate to which that value is connected, assume that Rate as IRR₁.

→ Calculate NPV using IRR₁.

Step-4 If NPV in Step-3 is Positive, calculate another NPV using Higher Rate.

If NPV in Step-3 is Negative, calculate another NPV using Lower Rate.
(Take Diff. of 4%).

Step-5

$$\text{IRR} = \text{Lower Rate} + \frac{\text{Diff}}{\text{b/w Two Rates}} \left[\frac{\text{PV@ Lower Rate} - \text{Initial Investment}}{\text{PV@ Lower Rate} - \text{PV@ Higher Rate}} \right]$$

5. Project - A Initial Investment = 15 Cr.

Step-1 Avg. C.F. = $\frac{4+4+3+4+5+4+2}{7} = \frac{26}{7} = 3.71$ Cr.

Step-2 $\frac{\text{Initial Inv.}}{\text{Avg. C.F.}} = \frac{15\text{ Cr.}}{3.71\text{ Cr.}} = 4.043$

Step-3 Check 4.043 in PVIFA table for 7 yrs.

Nearest value in PVIFA for 7 yrs = 4.039

\therefore IRR₁ = 16%, NPV @ 16%.

Yrs.	CFAT	PVIF @ 16%	P.V. of C.F.
1	4	0.862	3.448
2	4	0.743	2.972
3	3	0.641	1.923
4	4	0.552	2.208
5	5	0.476	2.380
6	4	0.410	1.640
7	2	0.354	<u>0.708</u> 15.279

\therefore NPV = P.V. of Cash Inflow - P.V. of Cash Outflow
 $= 15.279 - 15$
 $\Rightarrow \boxed{= 0.279 \text{ Cr.}}$

Step-4 As NPV in Step-3 is Positive, we will calculate another NPV at higher rate (20%)

Yrs.	C.F.	PVIF @ 20%	P.V. of C.F.
1	4	0.833	3.332
2	4	0.694	2.776
3	3	0.579	1.737
4	4	0.482	1.928
5	5	0.402	2.01
6	4	0.335	1.34
7	2	0.279	0.558
		P.V.	13.681

$$\begin{aligned} \text{NPV} &= \text{P.V. of Cash Inflow} - \text{P.V. of Cash Outflow} \\ &= 13.681 - 15 \\ &= -1.319 \text{ Cr.} \end{aligned}$$

Step-5

$$\text{IRR} = \text{Lower Rate} + \frac{\text{Diff blw PV@ Lower Rate} - \text{Initial Invlt}}{\text{PV@ Lower Rate} - \text{PV@ higher Rate}}$$

$$\begin{aligned} &= 16 + \frac{15.279 - 15}{15.279 - 13.681} \\ &= 16 + 4 \left[\frac{0.279}{1.598} \right] \end{aligned}$$

$$= 16 + 4 (0.175)$$

$$= [16.69\%] \text{ OR } [16.7\%]$$

* Modified Internal Rate of Return (mIRR)

Step-1 Calculate Present Value of Cash Outflow.

Step-2 Calculate Terminal Value (Future Value) of Cash Inflows

$$TV = \sum_{t=0}^n CF (1+i)^t$$

Step-3 P.V. of cash Outflow = $\frac{\text{Terminal Value}}{(1 + \underline{\text{mIRR}})^n}$

Example

Cost of Capital / Discount Rate = 15%.

Yr.	CF
0	-120
1	-80
2	20
3	60
4	80
5	100
6	120

Step - P.V. of Cash Outflow = $\frac{120}{(1.15)^0} + \frac{80}{(1.15)^1}$
 $= 120 + 69.66$
 $\boxed{I = 189.66}$

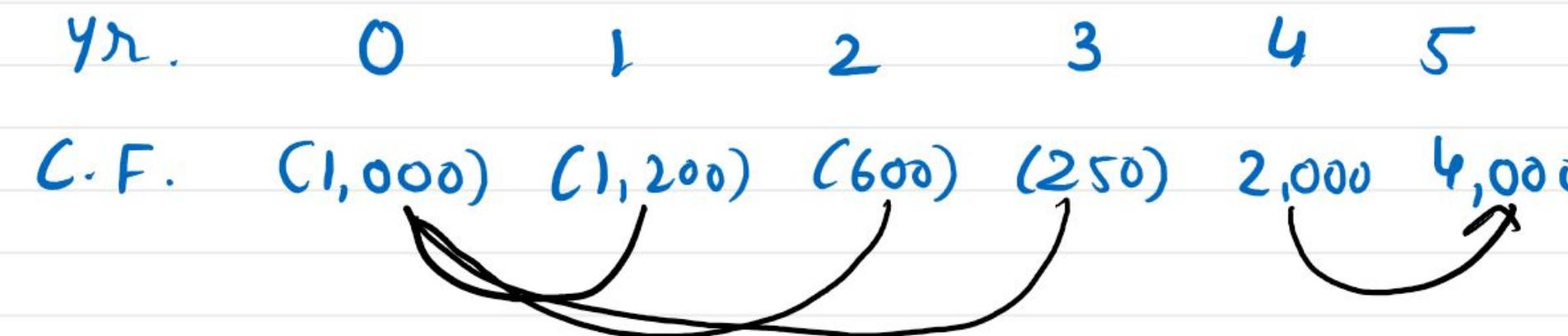
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P.V. of cash outflow

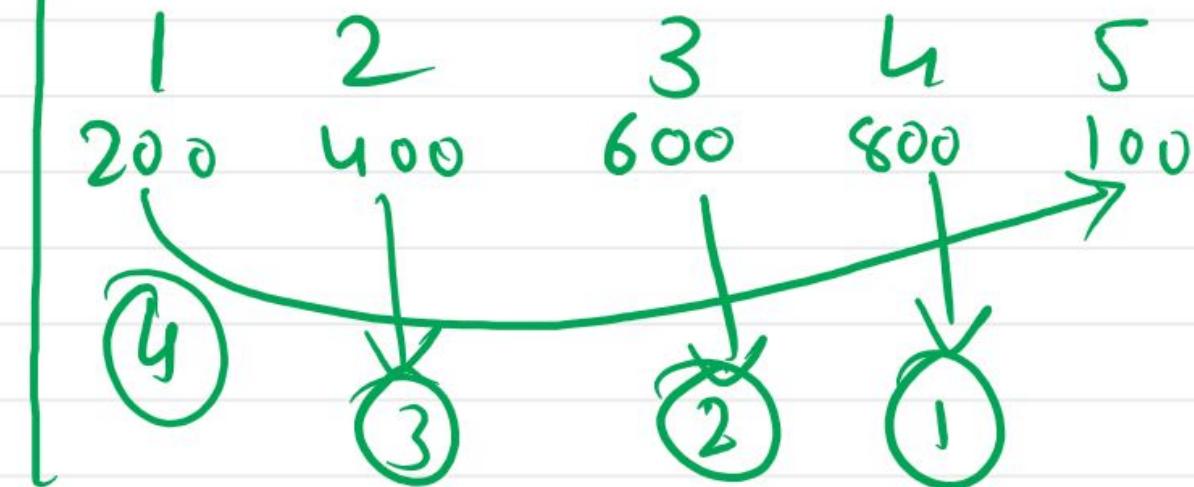
Yr	CF	PVIF @ 15%	PV
0	-120	1	-120
1	-80	0.870	-69.6
			$\boxed{189.6}$

Extra Question

Project P



Project Q



MIRR P.V. of cash outflow.

Yr	CF	PVIF @ 12%	PV
0	-1,000	1	-1,000
1	-1,200	0.893	-1,071.6
2	-600	0.797	-478.2
3	-250	0.712	-178
			2,727.8

$$TV = 2,000 \times (1.12)^1 + 4,000$$

$$= 2,240 + 4,000$$

$$T = 6,240$$

Cost of Capital = 12%

$$\text{PV of cash outflow} = \frac{TV}{(1+MIRR)^n}$$

$$2,727.8 = \frac{6240}{(1+MIRR)^5}$$

$$\therefore (1+MIRR)^5 = \frac{6240}{2727.8}$$

$$= 2.288$$

$$1+MIRR = (2.288)^{1/5}$$

$$1+MIRR = 1.18$$

$$MIRR = 0.18 \text{ OR } \underline{\underline{18\%}}$$