Capital Budgeting Techniques

1) Payback period
2) Discounted payback period
3) Net Present value (NPV)
4) Profitability Index
5) Internal Rate of Return (IRR)
6) Modified IRR

1) Payback period:

The amount of time required for a firm to recover its initial investment in a project as calculated from cash flows

→ **Decision Criteria**: Select the lesser value while comparing

If pay back period < minimum acceptable payback = Reject

If pay back period > minimum acceptable pay back period = accept the project

Advantages:

→ Simple to use → Quick solution
→ easy to understand → Preference to liquidity
→ Useful in case of uncertainity

Disadvantages:

→ Ignore time value of money
→ Not all cash flow recovered
→ Not realistic & ignores profitability
→ Neglect the project return on investment

Q1) Accept if 4 years

year	Project A	Project B
	−100000	−100000
1	10000	40000
2	20000	30000
3	30000/60000	20000/90000 ✓
4	40000	10000 (20000)
5	20000	20000
	4 yrs	4 yrs
	Accept	accept

$$\text{year} + \frac{\text{Required CF}}{\text{Total CF}}$$

$$3 + \frac{10000}{20000}$$

$3 + 0.5 =$ **3.5 yrs**

2) Discounted pay back period

$r = 10\%$ $\quad PV = \frac{CF}{(1+r)^n}$

q1)

year	Project A	Project B
	−100000	−100000
1	10000	40000
2	20000	30000
3	30000	20000
4	40000	20000
5	20000	20000

B

$PV = \frac{40000}{(1+0.1)^1} = 36363$

$PV = \frac{30000}{(1+0.1)^2} = 24793$

$PV = \frac{20000}{(1+0.1)^3} = 15026$

$PV = \frac{20000}{(1+0.1)^4} = 13660/89842$

$PV = \frac{20000}{(1+0.1)^5}$

$89842 < 100000$ reject the project

3) Net Present Value (NPV) :

→ Capital budgeting technique found by subtracting a project initial investment from the present value of its cash inflows discounted at a rate equal to the firms cost of capital

Formula :

$$NPV = \frac{CF_1}{(1+r)^n} + \frac{CF_2}{(1+r)^n} + \frac{CF_3}{(1+r)^n} \cdots - CF_0$$

(uneven cash flows)

CF_0 = initial investment

$$NPV = \left[\frac{CF}{r}\right] \times \left[1 - \frac{1}{(1+r)^n}\right] - CF_0$$

Decision criteria :

If $NPV > 0$, accept the project

If $NPV < 0$, Reject the project

, while comparing with several project accept the project with highest NPV value

Advantages :

→ It incorporates time value of money
→ Considers a company's cost of capital
→ Less uncertainity

Disadvantages :

→ Not useful for comparing different size of projects
→ Quantitative in nature, not qualitative

Q3) Initial investment = 95000, life = 5yrs
cost of capital = 12%.

year	CF		
1	20000	$\frac{20000}{(1+0.12)^1}$	= 17857
2	25000	$\frac{25000}{(1+0.12)^2}$	= 19930
3	30000	$\frac{30000}{(1+0.12)^3}$	= 21354
4	35000	$\frac{35000}{(1+0.12)^4}$	= 22243
5	40000	$\frac{40000}{(1+0.12)^5}$	= 22697

104081 − CF_0

104081 − 95000 = **9081**

NPV = 9081 > 0, accept the project

4) **Profitability index** : (PI)

$PI = \frac{NPV}{CF_0}$, CF_0 = initial investment

$PI = \frac{9081}{95000} = 0.095 \times 100 =$ **9.5 %**

Decision criteria:

PI > 1 = accept the project
PI < 1 = reject the project

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5) Internal Rate of Return (IRR):

→ **Definition**: IRR is that rate at which the sum of discounted cash flows equals the sum of ~~discounted cash outflows~~ initial Investments

→ It is the rate at which discounts the cash flows to zero

Accept / Reject approach :

If IRR ≥ cost of capital = accept the project

If IRR < cost of capital = reject the project

Advantages :

→ Considers the time value of money
→ Takes the amount of revenue & expenses
→ Gives more importance to the present money value

Disadvantages :

→ Very difficult in computing
→ Ignores the size of the project
→ Ignores future costs
→ Reinvestment presumption

* If you want to decrease the PV of CF increase the rate of interest
→ If you want to increase the PV of CF decrease the rate of interest

$$PV = \frac{FV}{(1+r)^n}$$

Q1)

Year	Cash flow	let IRR = 14%	let IRR = 15%
0	−80000		
1	15000	$PV = \frac{15000}{(1+0.14)^1} = 13158$	$PV = \frac{15000}{(1+0.15)^1} = 13043$
2	20000	$PV = \frac{20000}{(1+0.14)^2} = 15389$	$PV = \frac{20000}{(1+0.15)^2} = 15123$
3	25000	$PV = \frac{25000}{(1+0.14)^3} = 16874$	$PV = \frac{25000}{(1+0.15)^3} = 8438$
4	30000	$PV = \frac{30000}{(1+0.14)^4} = 17762$	$PV = \frac{30000}{(1+0.15)^4} = 17153$
5	35000	$PV = \frac{35000}{(1+0.14)^5} = 18178$	$PV = \frac{35000}{(1+0.15)^5} = 17402$
		81361	79159

$$\text{Lower rate of return} + \frac{(\text{Higher rate} - \text{lower rate})(\text{Higher amount} - \text{Initial Investment})}{\text{Higher amount} - \text{lower amount}}$$

$$14 + \frac{(15\% - 14\%)(81361 - 80000)}{(81361 - 79159)} = 14 + \frac{1361}{2202}$$

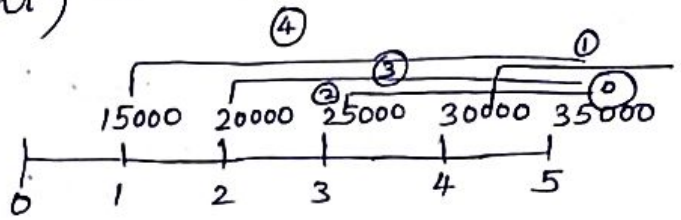
$$= 14 + 0.61 = \boxed{14.61\%}$$

$$\boxed{IRR = 14.61\%}$$

6) Modified Internal rate of Return (MIRR)

Formula: $MIRR = \left(\frac{FV}{\text{Initial investment}}\right)^{1/n} - 1$

$FV = PV(1+r)^n$



Q4) Cost of capital = 12%

year	CF		
0	−80000		
1	15000	$FV = 15000(1+0.12)^4$	= 23603
2	20000	$FV = 20000(1+0.12)^3$	= 28098
3	25000	$FV = 25000(1+0.12)^2$	= 31360
4	30000	$FV = 30000(1+0.12)^1$	= 33600
5	35000	$FV = 35000(1+0.12)^0$	= 35000
			FV = 151661

$$MIRR = \left(\frac{FV}{II}\right)^{1/n} - 1$$

$$= \left(\frac{151661}{80000}\right)^{1/5} - 1 \qquad (1.8957)^{0.2} - 1$$

$$= 1.1364 - 1 = 0.1364 \times 100 = 13.64\%$$

13.64% > 12% (cost of capital) = accept the project ✓

Decision Criteria:

If MIRR > cost of capital, accept the project

If MIRR < cost of capital, reject the project