→

0	1	2	. . .	n
(5,00,000)	x_1	x_2		x_n

Rs. 5,00,000
IRR = 23%
A new project

Rs. 20,000
consulting fee
↑
have to pay this even if we do not take up the project.

anything common b/w 2 alternatives ← Sunk cost – cannot recover it.

→ Do not consider sunk costs while considering cash flows.

Principles for estimation of cash flows for a project

→ Sunk cost – do not consider

→ Incremental Cash Flow

For expansion projects:-

0	1
(30,000)	(20000 − x)

↑ already being produced earlier

→ Relevant Cash Flow

→ Opportunity Cost

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→ Opportunity cost

→ Side Effects → Affecting sale of one product due to launch of another product.

→ Financing decisions v/s Investment decision

→ Checking feasibility of a project:-

Marketing (Demand)
Technical
Socio-economic
Financial

→ Classification of Project :-

Conventional

Non-conventional

	0	1	2	3	4	5
→ P1	(200)	500	900	700	1200	1500
1 sign change P2	(2100)	1,000	1,800	(300)	2400	1800

↑ 3 sign changes

> 1 Sign change ⇒ Non-conventional

→ Capital Budgeting Exercises

(CS1)	0	1	2	3	4	5
PBIT		200,000	310,000	350,000	400,000	320,000
NOPAT Net Operating Profit After Tax = PBIT x (1-T)		140,000	217,000	245,000	280,000	224,000
Add depreciation		150000	150000	150000	150000	150000
Operating Cash Flow		290000	367000	395000	430000	374000
Salvage Value						50000
Initial Investment	(800000)					
Net Cash Flow	(800000)	290000	367000	395000	430000	424000

$PV = \frac{FV}{1+r}$ → Do not remove interest

↳ WACC includes interest

Accounting Rate of Return (ARR) = $\frac{\text{Average NOPAT}}{\text{Average Investment}}$

↑

$\frac{op+cl}{2} = \frac{800000 + 50000}{2}$

$= 425000$

$$ARR = \frac{221,200}{425,000} = 52.05\%$$

If benchmark ARR = 30%, accept the project.

	0	1	2	3	4	5
→ Cumulative Cash Flow	(800000)	(510000)	(143000)	252000	682000	1106000

$$\text{Payback Period} = 2\text{yrs} + \frac{143000}{395000} \times 365 \text{ days}$$

$$= 2 \text{ yrs } 133 \text{ days}$$

$$= 2 \text{ yrs } 4 \text{ months } 13 \text{ days}$$

If benchmark = 3 yrs, accept.

Discounted PBP → take care of time value of money.
PBP → does not consider CF after payback period.

→ $WACC = 0.5 \times 0.12 \times (1 - 0.30) + 0.50 \times 0.16$

$= 12.20\%$

NPV = PV of cash inflow − PV of cash outflow

	0	1	2	3	4	5
PV of CF	(800000)	$\frac{290000}{1.122}$	291529	279653	271330	238453
		$= 258468$				

NPV 539,433

→ Criteria: NPV ≥ 0

→ IRR → Rate at which PV of Cash inflow = PV of cash outflow

i.e., NPV = 0

$$800,000 = \frac{290,000}{1+r} + \frac{367000}{(1+r)^2} + \frac{395000}{(1+r)^3} + \frac{430000}{(1+r)^4} + \frac{424000}{(1+r)^5}$$

$\Rightarrow r = 35.05\%$

Accept if IRR ≥ COC

→	X	Y
0	(10)	(100)
1	20	150
IRR	100%	50%
NPV	6.67	25

Expected rate of return = 20%.

↑ the other Rs. 90 would be invested at R_f.

	Y − X
	(90)
	130
IRR	44.44% > 20%

Since incremental project is favourable, go for project Y.

→ Mostly conflicts are resolved in favour of NPV.

(CS1 contd.)

→ Profitability Index (PI)

→ Gross PI or Gross Benefit - Cost Ratio =

$$\frac{\text{PV of cash inflows}}{\text{PV of cash outflows}}$$

→ Net BCR or Net PI = Gross PI − 1

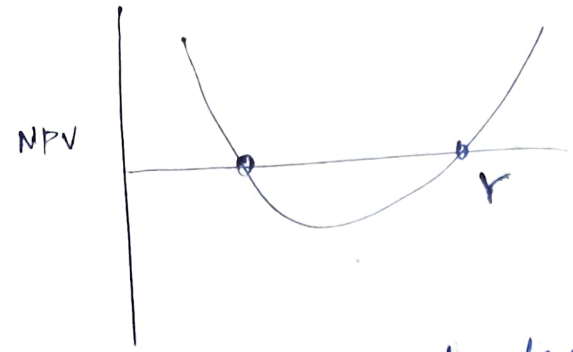
→ Criteria: Gross PI ≥ 1 (or) Net PI ≥ 0

Gross PI = 1.6743

Net PI = 0.6743

(9-12) Crossover Rate → Rate at which NPV of both projects become equal

→



Non-conventional projects lead to multiple IRRs.
↑
more than 1 sign change

→ SP = Rs. 200
Initial investment in fixed assets = Rs. 20,000
Initial working capital = Rs.

	0	1	2	3	4
# of units Sale		200 40000	250 50000	320 64000	280 56000
O.I.	(20,000)				
WC	(4000)				
ΔNWC		(1000)	(1400)		
Recovery of NWC				800	5600

(CS2)

→ CF = $[Q \times (SP - VC) - FC - Dep] \times (1-T) + Dep$
(fixed cost (rent, electricty, etc.))

(1st year)
(all years) $= (10,000 \times (120 - 50) - 150,000 - 200000) \times (1 - 0.30) + 200000$

$= 4,45,000$

$4,45,000 \times PVIFA(15\%, 5) + \frac{200000}{(1.15)^5} + \frac{100,000}{(1.15)^5}$
(WC) (SV)

$- 1100000 + 200000$
In. Inv. WC

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→ NPV v/s IRR conflict

NPV assumes reinvestment rate @ CoC.

IRR " " " @ IRR itself.

→ Discounting – Bring back all negative cash flows to t = zero.

(9-19)

↳ At t=0, with -ve cash flows,

$$-16,000 - \frac{5100}{(1+0.10)^5} = -19,166.69$$

→ Reinvestment approach –

Take all CF except t=0 to last year.

0	1	2	3	4	5
(16,000)					-5100
					+ 6,500 × 1.10
					+ 8,400 × (1.10)²
					+ 7,800 × (1.10)³
					+ 6,100 × (1.10)⁴

= 31,526.81

Now treat like zero-coupon bond.

$$MIRR = \left(\frac{31,526.81}{16,000}\right)^{1/5} - 1 = 14.53\%$$

→ Combination approach –

Bring all -ve to t=0, and all +ve to the end.

t = 0	v/s	t = 5
-19,166.69		36,626.81

$$MIRR = \left(\frac{36,626.81}{19,166.69}\right)^{1/5} - 1 = 13.83\%$$

→ Q. 100 units VC = 50%.

P Rs. 30

x_1	x_2	...	...
3000			
1500 → VC			
1500 → contribution Margin			
(2700)			
(1200) → PBIT			

2700

Rent Rs. 600 (common b/w continuing & discontinuing) — should not be considered.

similarly - depreciation, (Rs. 700)

→ Say, a pipeline project :-

(20,000)	(40,000)
(5,000)	(6,000)
(5,000)	
⋮	⋮
8 years	12 years

r = 10%.

Consider project with least negative NPV.

→ Needs to be replaced after 8 years,

8th yr cash flow = −20,000 − 5,000 = − 25,000

Take lcm = 24, compare now.

Replacement chain approach.

→ Equivalent annual cost (EAC) = $\frac{NPV}{PVIFA(r,n)}$ ↗ when NPV < 0

Equivalent annual benefit (EAB) ↗ when NPV > 0

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→

Net w.c. required @10 = Rs. 1000

VC (as % of Sales) = 40

F.C. (excl. dep) p.a. = Rs. 3000

Original cost of machine = Rs 30,000

S.V. at 5th yr end = Rs 5,000

	0	1	2	3	4	5
Sales	-	10,000	14,000	19,000	23,000	16,000
V.C.		4000	5600	7600	9200	6400
Contribution Margin		6,000	8,400	11,400	13,800	9,600
F.C. excl dep.		3,000	3,000	3,000	3,000	3,000
Depreciation		5,000	5,000	5,000	5,000	5,000
EBIT		(2,000)	400	3,400	5,800	1,600
NOPAT (T=25%) = EBIT(1-T)		(1,500)	300	2,550	4,350	1,200
OCF (NOPAT + Dep.)		3,500	5,300	7,550	9,350	6,200
Original cost - machine	(30,000)					
Net working capital	(1,000)	(4,00)	(5,00)	(400)	700	1,600
S.V @ 5th yr. end.						5,000
Net Cash Flow	(31,000)	3,100	4,800	7,150	10,050	12,800

Calculate NPV.

→ Floatation Cost (w.r.t. CoC)

Bond Coupon 10% payable semi-annually

F.V. 1,000

Issue pr. 1,100

Redemption @ F.V.

Time to mature = 6 years, Floatation cost = 1%

$$K_d(\text{pre-tax}) = \frac{50 + \frac{1000 - (1100 - 11)}{12}}{0.6 \times 1089 + 0.4 \times 1000}$$

(1089)

→ Say, preference share :-

Div = 12%

FV = RS. 100

Issue price = RS. 98

Floatation cost = 1%

N = ∞

$$K_p = \frac{12}{98 \times 0.99}\ \%.$$

$$K_p \text{ (without floation cost)} = \frac{12}{98}$$

$$K_p \text{ (with F.C.)} = \frac{K_p \text{ (without F.C.)}}{(1 - \text{F.C.\%})}$$

→ Capital Structure — Mix of long-term finance

→ Concept of Leverage.

→ Debt has a fixed rate of interest

EBIT	1,000	1,000
Int.	300	-
	700	1,000
Tax @ 25%	(175)	(250)
	525	750

(75) → 25% of Int.