PREFACE

This summary notes doesn't guarantee passing the exam.

IT IS ONLY MEANT TO CONDENSE THE HUGE CONTENT OF ICMAI.

One needs to have a visualisation of connected questions with every concept studied here.

THE VISUALS COME ONLY WHEN YOU HAVE PRACTICED THE CONNECTED SUMS AT LEAST 3 TIMES AFTER UNDERSTANDING THE LOGIC BEHIND THE CONCEPTS.

For effortless understanding of logic and practice of sums once, Join full classes of SFM with Satish Sir.

Exclusively taught as per CMA Final Course.
ICMAI Material Covered with all practicals and theories.

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"I believe in - showing students how to cook rather than to give the food. Specially, I have also given sessions for preparing summary notes, where I am showing the process of how to summarise the big chapters. This would help you in all other subjects." - Satish Sir

Reviews of our regular classes of SFM

The books were great with regards to the content and coverage that has been provided. I really liked the numerous variation of sums that were provided to us in the entire course. I really loved the flow of the classes and the content was very well covered.

Thanking You.
Dipti Saraf

The content in the book is very good and well organized, there is extra space for page numbers and what is new is very useful and saves time for study, also the quality of the book is very good including the quality of paper and binding of the book.

Anjali Kumari Shaw

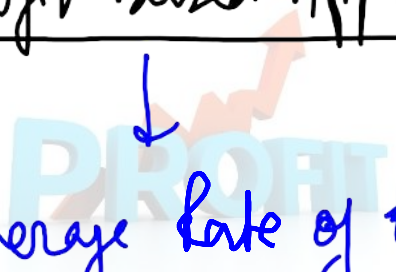
Capital Budgeting

Capital Budgeting

- Methods
- Special Cases

Methods

- Profit Based Approach
  - ↓ Average Rate of Return (ARR)
- Cash Flow Based Approach
  - without time value of money
    - ↓ Pay Back Period Method
  - with time value of money
    - ↓
    - DPBP
    - NPV
    - PI
    - Adj NPV
    - IRR
    - Multiple IRR
    - Modified IRR
    - Modified NPV



Cash Flow Approach

Initial CF → at Y_0

- II in FC ✓ *
- II in WC ✓
- (–) Subsidy (✓)
- ✓

Intermittent CF → Y_1 to Y_{n-1}

- Sales ✓
- (–) VC
- FC
- Depn
- PBT ✓
- (–) Tax (✓)
- PAT ✓
- (ignore Int)
- (+) Depn ✓
- CFAT ✓
- (–) Add FC or WC (✓)
- Net CFAT ✓

Terminal CF → Y_n

- CFAT. ✓
- (+) Salvage. ✓
- (–) CG tax or (✓)
- (+) CL tax shield ✓
- (+) WC Recov ✓
- ✓

* Agar loan le kar fixed assets liya hai toh, loan ka instalment intermittent CF ban ke ayega, II mein kuch nahi ayega.

Method Name	Calculation	Decision Making	Adv	Disadv
1) ARR = Avg ROI	$\frac{\text{Avg Return}}{\text{Avg Inv}}$ or $\frac{\text{Avg Return}}{\text{I. Inv}}$ Avg Return pa = $\frac{\Sigma PAT}{n}$ Avg Inv = $\frac{II + SV}{2}$ or [Q1] $\frac{\Sigma \text{Avg Inv}}{n}$	ARR > cut off = Accept ARR < Cut off = Reject ARR = Cut off = IADiff	1. A/cing Concept 2. Easy 3. Popular ROI	1. Meaning of Pft is diff 2. Ignores time value 3. Avg inv has diff approaches
2) PBP	Equal CF = $\frac{II}{\text{CIFAT p.a}}$ Unequal CF Yr before the yr when CF crossed the initial inv + Time taken in the	PBP < Cut off period = Accept PBP > Cut off period = Reject PBP = Cut off = IADiff.	CF based Easy to Calculate & understand	Ignores CF after PBP Ignores time value of money

	Yr where CF crossed the II to cover the remaining amt **N1 P.B. Reciprocal** $PBR = \frac{1}{PBP}$ (how much % is recovered each yr) **N2 PB Profitability** = Post PB CF = Total CF over life − II	**Multiple Projects** Earlier PBP is better.		
3) **DPBP**	**S1**: PV of CFAT **S2**: Cum PV of CFAT **S3**: **DPBP** = PY of Yr where II is recovered + Time reqd for remaining inv.	Same as PBP	Same as PBP + Time value considered	CF after DPBP not considered

4) NPV	PV of CFAT over life − II	NPV Positive : Accept Negative : Reject 0 = IDD	• Time value • CF • Whole Life • Wealth Maxim (absolute amt)	Not for Company • diff size • diff life • diff CF timing Not for Cap Ration ing
5) PI	$\frac{\text{PV of CIFAT}}{\text{II}}$ • When Cap. available is limited. • CF per rupee invested	PI >1 Accept <1 Reject =1 IDD	Same as NPV + Helps in Cap Rationing when Cap is ltd. + Size desparity can be compared	• Not for Company • diff life • diff CF timing • Not in absolute amt

6) Adj NPV when both debt & Equity are used to finance the project	S1. Base Case NPV ↓ assume project financed by equity only. • NPV @ ke • Ignore given Debt/Equity Ratio S2: PV of Tax Savings due to debt financing (a) Tax Savings on Int pa = D×I×t (b) PV of tax Savings On Int (using pre tax kd) S3 Floatation Cost Adj NPV = S1 + S2(b) − S3	Same as NPV	For Project financed with Debt & Equity ↓ it is showing breakup of benefits from debt + Same as NPV	Same as NPV

7) IRR

$II = \frac{Cf_1}{(1+r)^1} + \frac{Cf_2}{(1+r)^2} + \ldots$ r = IRR **Guess using —** 1. TIF over life 2. Extra IF over II 3. Extra IF/yr 4. % of Extra IF/yr 5. r = 1.5 times of above Let r = such that one is higher & another is lower than above given. **Interpolation** • PV > II ⇒ low r • PV < II ⇒ High r IRR = Low 'r' + $\frac{\text{Diff in rate}}{\text{Diff in PV}} \times$ (High PV − II)	IRR > COC = Accept IRR < COC = Reject IRR = COC = IND	• Cf based • TV based • Easy to understand	• Complex • Conflict with NPV • Multiple IRR • Reinv Cf @ IRR

8) Multiple IRR	When addl inv occurs after start of the project E.g $10000 = \frac{18000}{1+r} - \frac{6000}{(1+r)^2}$ Solve using quadratic ↓ not solvable by us. (Q13)	COC < IRR₁ = Accept COC > IRR₂ = Reject COC is b/w IRR₁ & IRR₂ = I/Diff	Unable to decide when COC is b/w IRR₁ & IRR₂ ↓ Modified IRR Multiple IRR may also show negative IRR
9) Modified IRR	CF generated remains reinvested @COC rate S1 FV of CF using COC rate or	MIRR > COC = Accept	No Multiple IRR Negative

10) Modified NPV / Terminal NPV

reinv rate

S2 Modified IRR

$$II = \frac{FV \text{ of } CF}{(1+r)^n}$$

[If calcn not possible, stick to NPV]

CF is handled

S1 FV of CF using COC or Reinv rate

S2 Modified NPV = PV of step 1 − II

Negative CF is handled

If reinv rate = COC, no diff in Normal & Modified NPV.

Find Modified NPV when Reinv Rate is separately given.

Special Cases

General Rules

1. Given C/f is assumed as C/f before depr & tax
2. Equal cf/yr => PV = Cf p.a x PVAF
3. No tax => Depn ignored
4. Flow! – 1. II 2. Depn 3. CFAT
5. Ninja Trick No. 912 => Total PV in Calculator

E.g.:

CF	DF @11.3%	PV
60000		
20000		
10000		

$60000 \div \frac{1}{1.113} = M+$

$20000 = = M+$

$10000 = = = M+$

MRC

6. IRR Guesswork

CF uniform => IRR = Given r

CF ascending => IRR < Given r

CF descending => IRR > Given r

7. Depn on SLM => No STCG/STCL

BV = Salvage value

Depn on WDV ⇒ Asset is not fully depreciated

⇒ BV ≠ SV

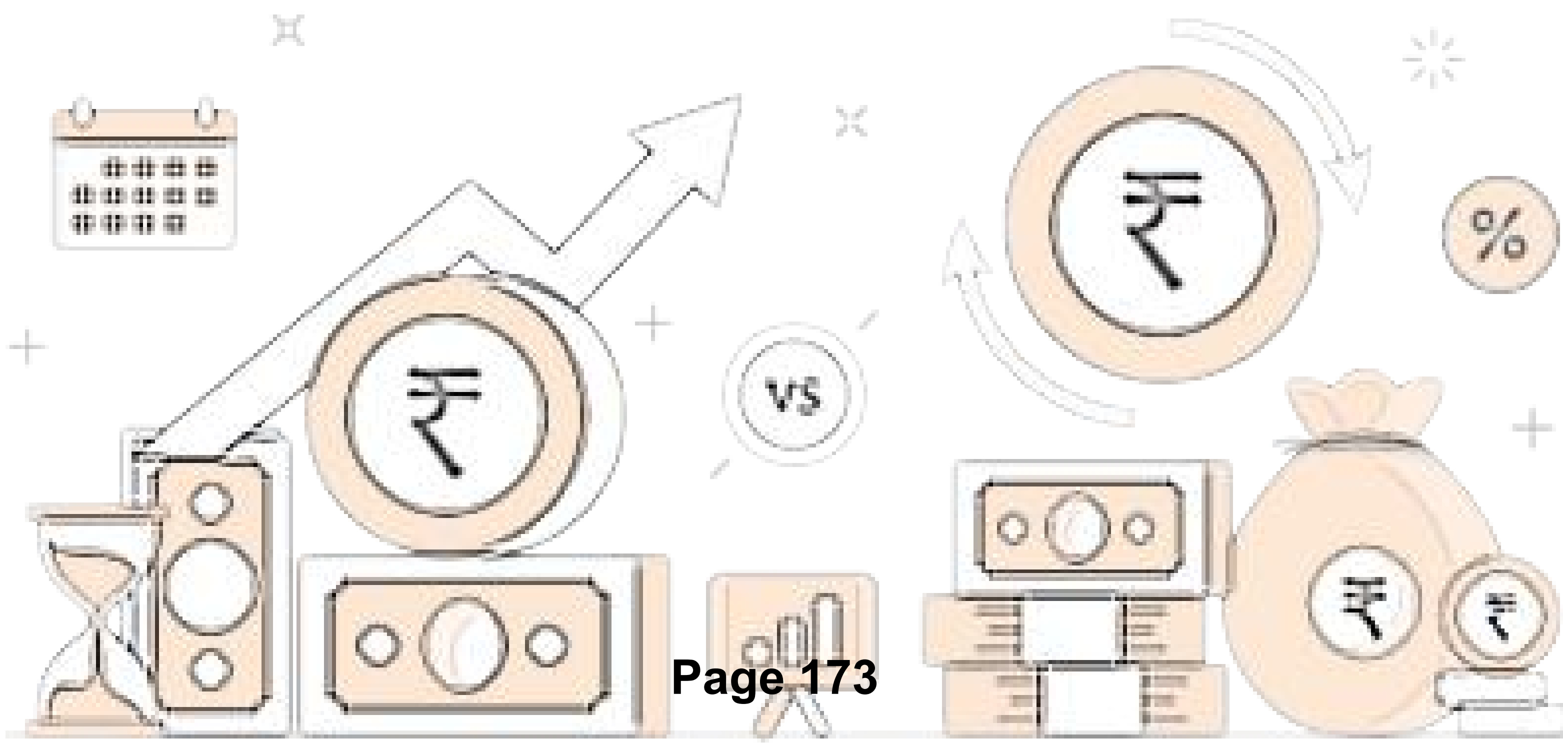
⇒ Salvage > BV ⇒ STCG → tax impact

⇒ Salvage < BV ⇒ STCL ⇒ Tax savings

8. Irrelevant Costs – Sunk Cost & Committed Cost

Committed cost = allocated / apportioned / absorbed / added.

9. If no method mentioned = Use NPV



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(1) When PBT is negative

[For existing Cos]

Set off in same Yr
⇓
assume other business exists
⇓
Tax Savings or Tax Shield in the yr of negative PBT to be taken
= [Negative PBT × tax Rate]
⇓
Assume this - if nothing mentioned

No other business exists

[For New Cos]

c/f to subsequent Yr
⇓
Yr of Negative PBT ⇒ No tax

Next Yr ⇒
= (Positive PBT CY − Negative PBT PY)
= If positive = then tax paid on such amt.

(2) Discounting factor

Hurdle rate / Minimum reqd rate of return / WACOC

(3) Relnship b/w NPV & IRR

NPV	CF & II	Excess Returns over COC	IRR vs COC
Positive	PV of CF > II	Positive	IRR > COC

Negative | PV of CF < II | Negative | IRR < COC

Zero | PV of CF = II | Nil | IRR = COC

(4) **Negative CF or Non Conventional CF**

- Avoid IRR — it can lead to multiple IRR
- Prefer – Modified IRR / Modified NPV

Modified IRR ⇓ COC / reinv rate reqd

Modified NPV ⇓ reinv rate (≠ COC)

(5) **NPV vs PI**

NPV = PV of CF − II

PI = $\frac{PV\ of\ CF}{II}$

PV of CF = PI × II

NPV = II × (PI − 1)

(6) **NPV vs IRR**

High IRR may not imply High NPV

Why? 3 Reasons

(a) Timing Desparity ⇒ uneven CF

⇒ Diff pattern of CF = ascending / descending in one in another

Soln: modified IRR / modified NPV

(b) Life desparity = Unequal lives

Soln: EAI or EAC

$$EAI = \frac{NPV}{AF(ko, n\ yrs)}$$ ⇒ Select higher EAI

$$EAC = \frac{PV\ of\ COFAT}{AF(ko, n\ yrs)}$$ ⇒ Select lower EAC

There are CF of their respective yrs, but equalised, not the PV.

(c) Scale desparity

Op. 1 : PI ⇒ more popular for Cap Rationing

Op 2: Inc Approach

Inc NPV or Inc IRR using Extra II and Extra CF from a big project

If Inc NPV is positive or Inc IRR > Coc, big project to be accepted

(7) Project IRR & Equity IRR — [Q22]

Project IRR = Normal IRR (Debt + Equity)

Equity IRR
a) II from Eq sh holders = ✓
b) CFAT available to Eq sh holders

Normal CFAT ✓
(−) Debt Repayment (✓) — given or EAI = Loan / AF(Kd, n)
✓

Find IRR from above = Equity IRR

Eq IRR > Proj IRR ⇒ because debt financing being cheaper

(8) EAC & EAI = Projects of Unequal lives

EAC ⇒ Machine buy decision – no inflow is given

⇒ lean EAC is better

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EAI => when inflow is given

=> Highest EAI is better.

(9) Replacement Decision = Incremental Approach

- Replacing new machine by discarding old.

(1) II	Continue Old	Replace with New	Increm
	Repair Cost ✓ (Cap exp)	PC of New ✓	
		(-) SV of old (✓)	
		Cnet of STCG/STCL)	
		(+) WC Reqd ✓	
	b	a	a-b
(2) Depn p.a (SLM/WDV)	✓	✓	✓
(3) CIFAT	✓ (if repair is revenue exp)	✓	✓

This is also a case of scale disparity

Find Inc NPV
Or
Inc IRR

If Inc NPV is positive — Replace
Inc IRR > COC — ✓

If machines are <u>not installed yet</u>, we may find their independent NPV.
If scale desparity is there ⇒ Prefer Inc NPV

Q25, Q26

<u>Note</u> <u>Replacement Theory</u> [Q27]

Yr	DF	PV of Running Cost	PV of Salvage value	Cap loss (PC – PV of SV)	Cum PV of RC	TC	AF	EAC
✓	✓	✓						
✓	✓	✓						
✓	✓	✓						

(for old machine which is already installed)

- lower EAC = Optimum replacement period
- lower EAC to be compared with EAC of New machine.

(10) Abandonment Valuations

Real Option

Embedded options in a project

- **Timing Option**
  - ↓ like a Call option
  - ↓ right to start at a later date
- **Follow On Investment Option**
  - ↓ like a Call Option
  - ↓ right to enter into a big project at a later date
- **Abandonment Option**
  - ↓ like a Put Option
  - ↓ right to abandon a project on a later date

2 Approaches

- **Scenario Analysis**
  - ↓ NPV - with & without the Options
- **Option Pricing**
  - ‖ Using BSM

(1) Timing Option

Step 1 NPV if project is started Now

Exp CF p.a = Σpx

NPV = PV of Exp CF − II

Step 2 NPV if project is started after 'n' yrs

Scenario 1 : High dd — NPV = PV of CF of high dd − II

2 : Med dd — "

3 : Low dd — "

If NPV is positive, then only the Timing option is exercisable.

i.e. If NPV is positive, then exercise, take positive NPV

If NPV is negative, then lapse, take NPV = 0

Expected NPV after n yrs = Σ(NPV × Pb)

Expected NPV at Y0 = $\frac{\text{Above Exp NPV}}{(1+r)^n}$

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Step 3 – Compare Step 1 & Step 2 to decide.

(2) Abandonment Option

⇒ Whether project should be abandoned or not?

Value of abandonment = PV of Expected Savings in CF due to abandonment

Step 1 NPV without Abandonment

- Exp CF = Σpx
- NPV using Exp CF

Step 2 Value of Abandonment Option

Value ↓ Benefit from abandonment

Scenario 1 : High dd ⇒ PV of CF if not abandoned ✓

PV of CF if abandoned ✓

If project is not abandoned,

abandonment Option lapsed.

∴ value of abandonment Option = 0

Scenario 2: Med dd ⇒ PV of CF if not abandoned ✓

PV of CF if abandoned ✓

If not abandoned, value of abandonment = 0

Scenario 3: Low dd ⇒ PV of CF if not abandoned ✓

PV of CF if abandoned ✓

If abandoned, (when PV of CF if abandoned is greater)

↓

value of abandonment = Diff in PV of CF if not abandoned & abandoned

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Exp value of abandonment after n yrs

= Σ Value of abandonment × Pb

PV of Exp value of abandonment after n yrs

$$= \frac{\text{Exp Value as above}}{(1+k_0)^2}$$

Step 3 ⇒ NPV with abandonment

= Step 1 + Step 2

Step 4 ⇒ Compare Step 1 & Step 3 to decide ⇒ Higher is better.

If NPV is negative in both Step 1 & Step 3 ⇒ Project is not viable

Alternative for Abandonment Option

Step 1 NPV without Abandonment

— Same (Scenariowise)

Step 2 NPV with Abandonment

- Assume abandonment is exercised
- Find NPV with abandonment in each sitn.
- Compare NPV with abandonment & NPV without abandonment for each scenario —
  - Select the one jisme NPV jyada hai
- Exp NPV from favourable NCS = $\Sigma NPV \times Pb_{fav.}$

Step 3 Value of Abandonment

= Step 2 − Step 1

[Q28]

(11) Modified Accelerated Cost Recovery System

=> Early write off of Purch Cost through addl depn, as applicable

=> No other impact

(12) Inflation Adjusted Cash Flow

Q30

CF

- **Real CF**
  - ⇓ Infl'n excl
  - ⇓ Discounted using real disc rate
- **Nominal CF** (Prefer this if no mention)
  - ⇓ Infl'n adjusted
  - ⇓ Discounted using Nominal disc rate.

The answer of NPV is same

Nominal CF = Real CF $(1 + \text{Infl'n})^n$

QRS - assume given CF is nominal.

(13) Capital Rationing

Divisible Projects
⇓
part investment is alld
⇓
Step 1 P.I. of each project
Step 2 Ranking of projects using PI
Step 3 Alloc^n of available Capital on the basis of Rank
⇓
Last project can be given remaining amt & proportionate NPV

Indivisible Projects
⇓
Part investment not alld.
⇓
full/reject
⇓
Create several combinations & select where NPV is maximum
⇓
Ignore the combinations that exceeds the total capital available.

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is taken from it.

⇓

Cost of idle money may be given.

[Q33]

Benefit Cost Ratio = 90%
∴ Cost of idle money = 10%

← Adjust its cost with NPV.

⇓

QRS ⇒ prefer indivisible

Using Linear Programming

⇓

Integer Linear Programming ⇒ value of variable ⇒ only 0 or 1

x = 0 = Project not done
x = 1 = Project will be done
x = between 0 & 1 = proportionately done

Divisible

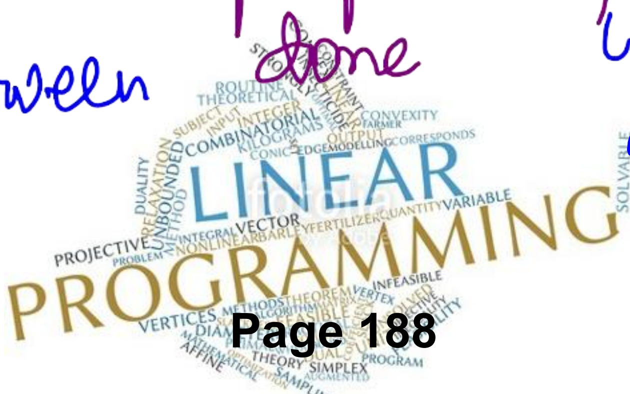
⇓

value of variable will be between 0 & 1

Indivisible

⇓

Value of variable will be either 0 or 1



- # If yr wise fund limits are given, use LP approach.

- # If a project is delayed (x_1 & x_2) ⇒ new variable reqd

- # If two projects are Complementary ⇒ new variable reqd (x_3)
  $\Rightarrow x_1 + x_2 + x_3 \leq 1$

- # If two projects cannot be done together ⇒ $x_1 + x_2 \leq 1$

- # If a project (x_7) cannot be accepted unless two other projects are accepted (x_2, x_4) ⇒ $x_2 + x_4 \geq 2x_7$
  or
  $2x_7 \leq x_2 + x_4$

[Q35]

[Q43, Q44]

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Thank You.