CAPITAL BUDGETING

- CB involves investment decision of the finance manager in long term asset.
- Features of LTA:-

(i) investment - initial year.
(ii) amount - huge
(iii) returns flow - future
(iv) future is uncertain ∴ returns — uncertain.
(v) irreversible - huge losses

∴ detailed analysis of LTA.

1) Consider dep seperately, profit dep - both net of tax.
2) always use annuity factor wherever possb.
3) always check profit or loss on sale of scrap.
4) Terminal value CF = end yr CF
5) FC = dep + allocated OH + cash FC (only take cash FC)

- Rules of CB

1) Only Cash Flows are imp - accounting profit & losses are not important as profits can be manipulated (paisa aaya ki gaya)

2) Only future cash flows are imp:- do not consider sunk cost/past CF. (kuch bhi ho jaaye change nahi hona chaiye)

3) Incidental or related CF only:- include all incidental or related CF, profits. (new aayi to old gayi ; main nu to mere wajah se hai (cost)]

- main & by product → by prod sold - incidental CF to main prod.

4) Include or Working capital Req:- hidden adjustment.
   - *aaj/aabhi - ini invst → cash outflow - w.c introduced
   - *end of proj - business wind → cash inflow - recovery of wc

5) Ignore all allocated overheads:- whether OH allocated are ↑ or ↓ simply ignore. allocated OHC not incidental) - thumb rule.

6) Ignore all financing CF:- as CB is invst decision. even if it is incidental

7) Non cash item - CF - only if Tax:-

CIF - non cash exp - TR x expense - tax benefit

COF - non cash income - TR x income - tax payment.

8) All exp all income net of tax:-

NET of tax = amt (1 - TR)

Techniques of Capital Budgeting.

Non discounting tech doesnt consider time value of money

Pay Back Period

Accounting Rate of return
Avg ROR
Book ROR

Discounting tech. considers time value of money.

Net Present Value (NPV)

Internal ROR
Time Adj ROR
Margin ROR

Modified IRR

Profitability index (PI)
Desirability factor.
Present value index.
Benefit cost ratio.

Discounted Pay Back Period.

Time Adj PBP.

Traditional NPV

Annualised NPV

PAY BACK PERIOD (PBP)

- period in which initial inv is recovered.
- shorter the period better the project.

To recover :- _____

Yr	CF	cumulative CF
1	x	x
2	x	x
3	(x)	x

PBP = yes + ? months

To recover = x
(-) 2nd yr (x)
addition x in 3rd yr

12m — (x)
?m — x

2] DISCOUNTED PBP

Time Adj PBP

- considers present value of CF rather only CF.

Yr	CF	PV @ _	PV(CF)	cum D.CF
1	x	..	..	..
2	x	..	..	..
3	x	..	(x)	..

To recover y
(-) 2nd yr (x)
x

can x — 3rd yr.
12m — x.
?m — addn.

always take discounted CF.

3) Acc ROR / Avg ROR / Book ROR

- return on inv based on avg profits for whole life.

ARR = Avg PAT for life of proj / net inv × 100

net inv = ii - scrap.

ARR > COC - accept
ARR < COC - reject

capital recovery factor = 1 / AF

4] NET PRESENT VALUE

NPV = PV(CIF) − PV(COF)
(Head)

NPV

+ve → accept project
−ve → reject
zero → accept only if non financial benefits.

- all CF @ end of year unless specified.
- give impact of TAX.

Yr Particulars CF PV@ DCF

5) PI

DESIRIBILITY FAC

Present Value Index

PI indicates DCIF generated for every Re 1 of DCOF incurred.

PI → 1.75 i.e
Rs 1.75 for every Re 1 incurred.

$$PI = \frac{PV \text{ of CIF}}{\text{initial inv}}$$

OR

$$= \frac{NPV + DCOF}{DCOF}$$

$$= \frac{NPV + \text{ini. inv}}{\text{in. inv}}$$

CB-2

PI interpretation

PI > 1	NPV +ve	accept
PI < 1	NPV −ve	reject
PI = 1	NPV = 0	only if non financial benefits.

6] ANNUALISED NPV

$$A\text{-}NPV = \frac{NPV \text{ (Head)}}{AF \text{ for } n \text{ yrs}}$$

n = life of project.

DISPARITY IN LIFE

Assump 1 → Proj will get repeated till infinity → annualised NPV

Assump 2 → one time proj. → NPV (traditional)

- nothing mentioned → take assump (1)
- question will not mention.
  - check disparity in life.
  - if yes — assump 1
    no — assump 2

Annualised NPV

−ve → equivalent annual cost = EAC.

+ve → equivalent annual benefit = EAB.

* if there is an option → of repairing old machine → as we can't go on doing that 4 life time.

INCREMENTAL NPV

↑ NPV = new NPV − old NPV

+ve — accept
−ve — no
0 — non financial benefit.

calculate — a) new over old project

Yr	Particulars	B old m	A new m	(A−B) ↑ CF	PV@ ↓%	DCF

Optimum replacement cycle ORC.

- period after which same asset should be replaced again & again so that - least cost max benefit.
- decide — $ANPV = \frac{NPV}{AF(n\text{yrs})}$
- life is 3 yrs then — replace after: 1 yr - ANPV, 2 yr ANPV, 3 yr ANPV
- highest ANPV is ORC.

ORC

Part 1 (hidden) — ORC of new machine

Part 2 — old be replaced by new.

7] INTERNAL ROR

- Indicates the ROR generated by proj based on cash flows.
- If disc is done on IRR

  NPV = 0

  ∴ PI = 1

- IRR > COC accept

  IRR < COC reject.

- Steps

1) Pay Back = $\frac{II}{\text{Avg life CF}}$.

2) Approximate → AF table
   find NPV @ this rate
   or @ 10%.

3) NPV +ve → ↑ IR (high rate) find NPV

   NPV -ve → ↓ IR (lower) find NPV

4) $IRR = \text{lower rate} + \left[\frac{NPV(LR)}{NPV(LR) - NPV(HR)} \times \text{diff in rate}\right]$

assump:- CF are reinvested @ ~~COC and not~~ IRR in the project.

8] Modified IRR

assump:- all CF are reinvested @ COC for projects life.

If life is 3 yrs. @ 10%. amt + int.

∴ 1st year → rein. for 2 yrs @ 10% → x

2nd → 1 yr. @ 10% → x

3rd → 0 yrs → x.

Total CF @ 3rd year. 3x

0 – II
3 – CF
> find IRR = MIRR.

Block of Asset

single asset → block (ITA)

① dep on a. WDV of block

a. WDV = Op WDV + Purch − sales (old)

② P/L on sale of asset is not calculated as long as block continues.
only @ end we find P/L.

③ When block ceases to exist i.e no other assets in block.
calculate P/L.
dep for (n-1) yrs.

Block

other assets → P/L – end yr.
dep = n-1 yrs.

no other assets → P/L −X
dep - full life.

INFLATION

	cash	rate
	real	real
	infln	NR.
	& - silent infln	NR.

$(1+RR)(1+IR) = (1+NR)$ (IR = inflation r)

dep^n = X infln.

0 year CF = X infln.

CAPITAL RATIONING

- Funds to be invested - limited.
- due to external & internal factors.
- decide on NPV or PI

divisible proj → PI

indivisible proj (feasibility) → NPV

- 3 methods

1) Feasibility set / Agg of profit / Total NPV :-
   - make combi of proj ≤ available funds.
   - calculate NPV of set
   - max NPV set - selected.

   only make sets having +ve NPV

2) PI method
   - rank proj as per PI.
   - accept proj till ini. invst is within the available funds.

3) IRR
   - rank as per IRR
   - accept till ini inv is within available funds

$$PI = \frac{NPV + ini.invst}{i.i}$$

$$\therefore NPV = PI \times i.i - in.inv.$$

$$= in.inv(PI - 1)$$

LEASE FINANCING

CB-3

Point of view of

lessor
- lease Rent to be charged
- is the lease financially viable +ve NPV
- IRR of lease NPO > 0.

lessee
- whether asset brought or leased. ↑NPV

- calculation of LR to be charged

Equated Plan | stepped plan | Ballon Plan | Deffered plan

PV of MLP = PV of net cost incurred

I] Equated Plan:

LR: start of year → end of year.

$$= \frac{PV(\text{net cost of asset})}{1 + AF@x\%\ \text{for } n-1 \text{ yrs}} = \frac{PV}{AF@x\%\ \text{for } n}$$

II] Stepped up lease ↑ a fixed rate per year

Year	Pal	CR	PV	PCF
1	LR	x	...	
2		x+↑		
3		x+↑+↑		

III) Ballon plan : ( ) less - beg^n more idle

IV) Deffered Plan: no - beg^n later LR.

PV of net cost incurred = same like NPV.

Tax

LR - beg^n	Tax - end			
0-4	LR	x	AF	x x
1-5	Tax on LR	(x x TR)	AF	(x)
			LR	=

Both end

0-5	LR(1-TR)	AF	x x

* Take all CF (Pnt, principal, loan etc)

RISK ANALYSIS IN CB.

Traditional

1. RADR
   - Risk adj disc rate
2. CE - certainity equivalent
3. Abandonment evaluation
4. Utility theory
5. Sensitivity analysis.

Statistical.

1. Std deviation
2. Co-efficient of variation
3. Probability distribution / normal distribution
4. Decision tree analysis
5. simulation

RADR

RADR = COC + risk premium rate.

CF: certain/dep" | uncertain (future)

COC: RADR.

CE

Convert UCF → CF and disc @ Rf*

CE factor = certain CF / uncertain CF

UCF × CE factor = CF. @Rf = NPV

ABANDONMENT EVALUATION

PV future CF > scrap - continue

PV future CF < scrap - abandon

analysis at every year end*

use if scrap value is given for each year end in question.

Utility theory

projects with maximum utility of CF are accepted

max CF - X imp.

SENSITIVITY ANALYSIS

Δ factor → Δ NPV

max sensitivity: NPV can absorb | NPV = 0.

factor - life - disc PBP

calculate for each factor seperately for comparision find % basis.

STANDARD DEVIATION

$S.D = \sqrt{\Sigma(x-\bar{x})^2 \cdot Pi}$ · √var

x = NPV - various sit.

$\bar{x}$ = avg NPV

NPV (x)	$\bar{x}$	$x-\bar{x}$	$(x-\bar{x})^2$	$(x-\bar{x})^2 \cdot Pi$
				$= \sigma$ — $\sqrt{\sigma^2}$

Co-effiuent of Vaiation

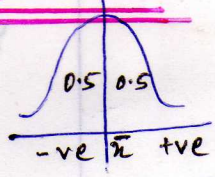
risk per unit of return

CO-eff = S.D / NPV

use when NPV of 2 Op" is diff.

Probability / normal distribution.

$Z = \frac{x-\bar{x}}{\sigma}$ Z → Pi. get.



x - req / given NPV

$\bar{x}$ - mean / exp NPV

σ - SD.

σ of project / NPV

disc σ of all CF or PV of σ — dependent / correlated.

$\sqrt{\Sigma(\sigma \times P.V\ fac)^2}$ — CF are independent & correlated.

DECISION TREE

represent info in a tree format.

eg

	units	sales	VC	cont"	ΣPi	profit × Pi
A	a					
	b					
	c					
B						
C						

CAPITAL RATIONING

funds are limited.

single period.

limited for 1 year

1. Feasibility set - Indivisible proj
2. Pi approach
3. IRR approach

multi period

more than 1

1. linear prog technique.