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CHAPTER NO. 11 : CAPITAL BUDGETING & RISK ANALYSIS

Points to be discussed :

→ Introduction

→ Evaluation of projects

- Traditional Methods
  - Pay back period
  - Average Rate of Return
- Modern Methods / DCF Techniques
  - Net present value
  - Internal Rate of Return
  - Discounted pay back period
  - Profitability index

→ Capital Rationing

→ Introduction to Risk Analysis in capital Budgeting

→ Methods of incorporating Risk

- Risk Adjusted Discount Rate
- Certainty Equivalent Factor
- Sensitivity Analysis
- Probability Approach
- Standard deviation
- Decision tree

→ Concept of Modified Internal Rate of Return

→ Annuity & perpetuity

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→ Introduction

This chapter deals with investment Decision w.r.t investment in Fixed Assets.

Capital Budgeting decisions are irreversible in Nature.

→ Evaluation of projects

- **payback period Method**

payback period is the time taken by a project to return back the investment in the project.

It can be calculated as follows :

Consistent cash inflows

$$PBP = \frac{\text{cost of the project}}{\text{consistent CI}}$$

Inconsistent cash inflows

PBP is calculated by preparing a table with cumulative column.

Example : Cost of project : ₹ 50,000

Yearly cash inflows	1	2	3
	25,000	15,000	20,000

Years	Cash inflows	Cumulative CI
1	25,000	25,000
2	15,000	40,000
3	20,000	60,000

} ₹ 50,000 lies in between

∴ PBP = 2 years + $\frac{10,000}{20,000}$ ← Extra cash needed (i.e 50,000 - 40,000)
← CI of next year

= 2 + 0.5 years

PBP = 2.5 years.

Decision Rule / Selection Criteria

ONLY SINGE PROJECT given

Project PBP < Target PBP : Select

Project PBP > Target PBP : Reject

Project PBP = Target PBP : Indifferent

MULTIPLE PROJECTS given

Select project with LOWEST Pay back period

- **Accounting Rate of Return Method**

ARR is based on the accounting concept of Benefits i.e NPAT

It is calculated as follows:

$$ARR = \frac{\text{Average NPAT}}{\text{Average investment}} \times 100$$

Where –

$$\text{Average investment} = \frac{\text{opening investment} + \text{closing investment}}{2}$$

opening investment → cost of project
closing investment → Savage value.

Decision Rule / selection criteria

only SINGLE project given

Project ARR > Target ARR : Select
Project ARR < Target ARR : Reject
Project ARR = Target ARR : Indifferent

MULTIPLE projects given

Select the project with HIGHEST Average Rate of Return

- **Net present value Method**

This technique considers Time value of Money

It is calculated as follows :

Net present value = present value of all cash inflows (-) Present value of all cash outflows

Types of cash outflows
- capital cost / cost of project
- investment in working capital

↳ usually take place at beginning. Hence, DF = 1

Types of cash inflows
- cash inflows from salvage
  - Terminal cash inflows
  - Hence, discounted with last years discounting factor
- cash inflows from Release of working capital
- cash inflows from operations
  - consistent cash inflows
    - PV = consistent CI × $PVAF_{(x\%, y)}$
  - inconsistent cash inflows
    - PV is calculated by preparing table.

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Decision Rule / selection criteria

Only SINGLE project given

Positive NPV : Select

Negative NPV : Reject

NPV of zero : Indifferent

MULTIPLE projects given

Projects with SAME LIVES

Select the project with HIGHEST Net Present value

Projects with DIFFERENT LIVES

Select the project with HIGHEST Equivalent Gain

$$= \frac{\text{NPV of project}}{\text{PVAF}(x\%, y)}$$

Calculation of Discounting Factors

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

Example: 12%

$$DF = \frac{1}{(1.12)^n}$$

where

n = no. of years.

- **Internal Rate of Return Method**

Internal Rate of Return is the expected rate of return from the project. It is the rate at which PVI becomes equal to PVO.

At IRR, NPV = 0.

It is calculated by Trial and Error method.

Decision Rule / selection criteria

Only SINGLE project given

IRR > COC : Select

IRR < COC : Reject

IRR = COC : Indifferent

MULTIPLE projects given

Select the project which gives HIGHEST Internal Rate of Return.

Note: In Exam, select options directly, to calculate IRR.

- **Discounted payback period method**

Normal payback period method ignores Time value of Money, which is overcome by Discounted payback period.

In this method, the only difference from payback period is that here, we consider the discounted cash inflows where as in payback period we consider the Gross cash inflows.

After discounting the cash inflows, the calculation of D-PBP is same as the PBP.

Decision Rule / Selection criteria

same as payback period method.

- **Profitability Index Method / Benefit Cost Ratio**

This is a variation of the NPV Technique

Formula : $PI = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$ i.e $\frac{PVCI}{PVCO}$

This Ratio shows the present value of cash inflows derived by a firm per rupee of cash outflow.

Higher the PI, better it is.

Decision Rule / selection criteria

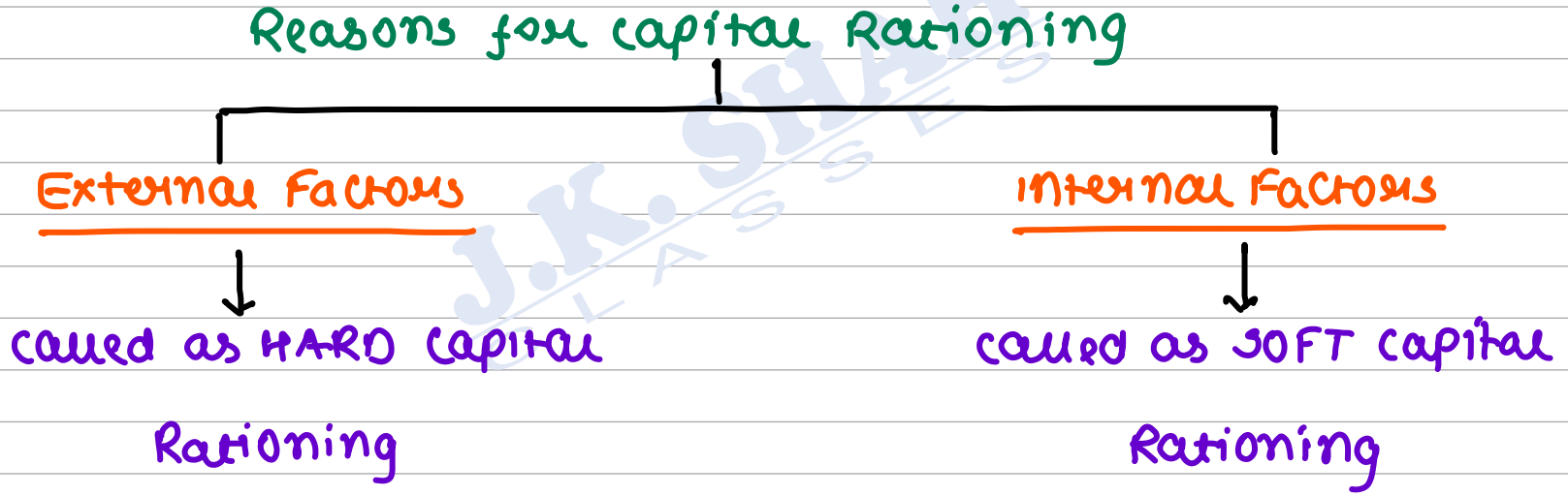
Only SINGLE project given	MULTIPLE projects given
PI > 1 : select	select the project with
PI < 1 : Reject	HIGHEST profitability
PI = 1 : Indifferent	index

→ Capital Rationing

Capital Rationing is a situation where funds are limited.

These limited funds are to be utilised in the Best possible manner

by using profitability index technique.



→ Introduction to Risk Analysis in capital Budgeting

Risk Analysis in capital budgeting helps a firm to take better investment decisions

This considers incorporating the element of Risk in capital Budgeting decisions

For this, there are 6 methods as follows :

- Risk Adjusted Discount Rate
- Certainty Equivalent Factor
- sensitivity Analysis
- Probability Approach
- standard deviation
- Decision tree.

- **Risk Adjusted Discount Rate Method**

This is the rate of discount calculated after incorporating risk in capital Budgeting decisions.

If a project has a higher risk, it should be discounted at a higher rate.

If a project is discounted at a higher rate, then the PVC decreases. If NPV is positive at this reduced PVC also, then the project should be accepted.

- **Certainty Equivalent Factor Method**

In this method, uncertain cash inflows are converted into certain cash inflows with the help of a certainty Equivalent Factor since certain cash inflows do not bear any risk, we use the

risk free rate of discounting

CE Factor is calculated as follows :

$$\text{CE Factor} = \frac{\text{certain cash inflows}}{\text{uncertain cash inflows}}$$

- **Sensitivity Analysis**

NPV is the result of various factors like cash inflows, the discounting rate, the no. of years, the cash outflows etc. If one of these factors change, NPV also changes. Sensitivity analysis helps the management in identifying that factor to which the NPV is most sensitive. In this method, one variable is changed at a time and impact of that change on the NPV is calculated.

- **Probability Approach**

When a firm is uncertain about its cash inflows of a particular year, but certain that the cash inflows will be from a given set only, then probability approach is used in this case. According to this method, probabilities are attached to the cash inflows and then Expected cash inflows are calculated.

Expected cash inflow = cash inflow × Respective probability

- **Standard deviation**

Standard deviation is a measure of Risk.

A higher standard deviation determines higher risk in the project.

that project which has a lower standard deviation shall be accepted.

- **Decision Tree**

When cash inflows of a particular year are dependent on the cash inflows of the previous year, then Decision Tree method is to be used.

This method involves the concept of joint probabilities

→ **Concept of Modified Internal Rate of Return**

Modified Rate of Return is that rate of return at which PVI = PVCO.

under this method, cash inflows of every year are not

withdrawn, rather they are reinvested upto the end of the project life. Every year's cash inflow will be re-invested upto the end of the project life and a lumpsum amount is received at the end.

Since this will be a terminal cash inflow, it shall be discounted with the last year's discounting factor to calculate PVC. The rate at which this PVC becomes equal to PVCO is called as Modified Internal Rate of Return.

- **Annuity and Perpetuity**

Annuity : same stream of cash inflows for a Definite period

Perpetuity : same stream of cash inflows for an Indefinite period

Annuity

PV = Annuity amount × PVAF(x%, y)

perpetuity

$$PV = \frac{\text{perpetuity amount}}{\text{interest rate}}$$

$$\text{Present value} = \text{Future value} \times \frac{1}{(1+r)^n}$$

$$\text{Future value} = \text{Present value} \times (1+r)^n$$

$$\text{Effective Rate of interest} = \left[\left(1 + \frac{NRR}{n}\right)^n - 1\right] \times 100.$$