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UNIT - III

CAPITAL BUDGETING

Capital Budgeting is the Process of evaluating and selecting investments in long term assets such as.

(1) Property : Land and buildings and Equipment
(2) Projects : New product development expansion, or Modernization
(3) Technology : Upgrades or New Systems.

key aspects :

(1) Investment Appraisal :
Evaluating the potential return on investment
(2) Risk Assessment :
Assessing the risk associated with the investment
(3) Funding :
Determining the source of funding for the investment

Techniques :

(1) Net Present Value (NPV)
Calculates the present value of future cash flows.
(2) Internal Rate of Return (IRR)
Calculates the rate of return on investment

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(3) Pay back Period:
Calculate the time required to recover the investment.

Importance of Capital Budgeting:
(1) Strategic Decision Making:
Capital budgeting helps organisations make informed decisions about investments.

(2) Resource Allocation:
Ensures efficient allocation of resources.

(3) Long Term Growth:
Supports long term growth and Profitability.

By applying Capital Budgeting techniques, organisations can make informed investment decisions and achieve their strategic objectives.

ARR
Accounting Rate of Return
The Accounting Rate of Return is a Capital budgeting technique that Calculates the return on investment based on accounting profits.

Advantages:
(1) Simple to Calculate: ARR is easy to Calculate and Understand.

(2). Accounting Data: Uses readily available accounting data.

Limitations:

(1) Ignores Time value:
ARR ignores the time value of money

(2) Accounting Profits:
Based on Accounting Profits, not cash flows.

(3) Does not Consider Risk:
ARR does not consider the risk associated with the Project.

Formula

ARR = (Average Anual Profit / Average investment) X 100.

Problems:

(1) A company invests ₹ 100000 in a Project that generates an annual profit of ₹ 20,000 for ₹ 5 years Calculate ARR

Average Annual profit = ₹ 20000

Average investment = ₹ 100000

Assuming Straight-line Depreciation

100000/2 = 50000.

$$ARR = \left(\frac{20000}{50000}\right) \times 100.$$

= 40%.

Ans: The ARR of 40% indicates that the Project generates a return of 40% on the average investment.

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(7) A company invests ₹ 50000 in a project that generates an annual profit of ₹ 10000 for 4 years. Calculate the ARR

Average Annual Profit = ₹ 10000
Average Investment ₹ $\frac{50000}{2}$ = 25000

ARR = $\left(\frac{10000}{25000}\right) \times 100$ = 40 %.

(8) A project requires an investment of ₹ 200000 and generates annual profit of ₹ 30,000 ₹ 40,000, ₹ 50000 & ₹ 60000 and ₹ 70000 ~~etc~~ over 5 years. Calculate the ARR.

Average investment = $\frac{2,00,000}{2}$ = 1,00,000

General profit for 5 years
30000 + 40000 + 50000 + 60000 + 70000
⇒ 250000
Annual profit = 250000
Average Annual profit = $\frac{250000}{5}$
= 50000

ARR = $\left(\frac{50000}{200000}\right) \times 100$
= 50 %.
ARR = 50 %.

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(4). A company is Considering two Projects, A and B Project A requires an investment of ₹1,00,000 and generates an annual Profit of ₹20000 for 5 years. Project B requires an investment of ₹ 1,50,000 and generates annual Profit of ₹30000 for 5 years. Calculate the ARR for both Projects and determine which one is more attractive.

Project A:

Average Annual Profit ₹ 20,000

Average Investment ₹ 100000 /2 = 50000

$$ARR = \left(\frac{20000}{50000}\right) \times 100 = 40\ \%$$

Project B

Average Annual profit = ₹ 30000

Average investment $\frac{₹\ 1,50,000}{2}$ = 75000

$$ARR = \left(\frac{30000}{75000}\right) \times 100 = 40\ \%$$

Solution: Both Projects have the same ARR, but Project A requires a lower investment

Payback Period.

The payback period is a Capital budgeting techniques ~~and~~ that Calculates the time required to recover the initial investment

Formula

$$\text{Payback Period} = \frac{\text{Initial Amount of Investment}}{\text{Annual Cash flow}}$$

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Payback Period Problems

① A company invests ₹ 1,00,000 in a project that generates annual cash inflows of ₹ 25000 Calculate the Payback Period.

Payback Period = Initial Investment / Cash inflow

= 100000 / 25000

= 4 years.

② A project requires an investment of ₹ 50,000 and generates cash inflows of ₹ 10,000 ₹ 15,000 and ₹ 20,000 and ₹ 25000 over 4 years Calculate the Payback Period.

Ans:

year	Amount	Cumulative
1	10000	10000 } Cumulative
2	15000 → +	25000 } Cumulative
3	20000 → +	45000 } Cumulative.
4	5000	(to reach 50000)

(year 4 ₹ 25000 over 4 years = 25000)

4 5000 − 50000 = 5000

Pay back period = 3 years + (₹ 5000 / ₹ 25000)

3 years + 0.2 years

= 3.2 years

③ A company is considering two projects, A and B. Project A requires an investment of ₹ 80,000 and generates annual cash inflows of ₹ 20,000 Project B requires an investment of ₹ 1,20,000 and generates annual Cash inflow of ₹ 30000 Calculate the Period Pay back period for both

So

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Project A

Payback Period = $\frac{\text{Initial Investment}}{\text{Cash Inflows}}$

$= \frac{80000}{20000}$

$= 4$ years.

Project B

Payback Period = $\frac{\text{Initial investment}}{\text{Cash inflows}}$

$= \frac{1,80,000}{30,000}$

$= 4$ years.

Both projects have the same payback period.

Net Present Value

Net present value (NPV) is a capital budgeting technique that calculates the present value of future cash flows.

Formula: $NPV = \sum (CFt/(1+r)^{\wedge}t) -$ initial investment

Key Concepts:

(1) Cash flow (CFt): Expected cash inflows or outflows.

(2) Discount Rate (r): Rate used to discount future cash flows.

(3) Time (t): Time period for cash flow.

Decision Rule:

Accept: Projects with a positive NPV

Reject: Projects with a negative NPV.

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Interpretation

NPV > 0; Project is Profitable (accept)
NPV < 0; Project is not Profitable (reject)
NPV = 0; Break even (May accept depending on other factors)

Single Cash Flow

(1) You invest ₹ 1,000 today in a Project that will return ₹ 1200 in 1 year. If the discount rate is 10%, what is the NPV?

$$NPV = \left\{ \sum \left(\frac{CFT}{(1+r)^{\wedge} t} \right) \right. - \text{initial investment}$$

CFT ⇒ Expected cash inflows / outflows = 1200. (return)

r ⇒ Rate used to discount future cash flows = 10% (0.10)

t ⇒ Time Period for Cash flow = 1 year

initial investment = ₹ 1000

$$NPV = \sum \left(\frac{1200}{(1+0.10)^{\wedge} 1} \right) - 1000$$

$$= \frac{1200}{1.10} - 1000$$

$$= 1090.90 - 1000$$

$$= 90.9$$

NPV = ~~400~~ 91

NPV > 0

Decision: Accept the Project (NPV > 0)

Practice Sums:

(2) You invest ₹800 today. You expect to receive ₹1000 in one year. The discount rate is 12%. What is the NPV?

$$NPV = \sum \left(\frac{CFT}{(1+r)^{\wedge} t} \right) - \text{initial investment}$$

CFT ⇒ Expected Return = 1000

r ⇒ Rate used to discount = 12% (0.12)

t = Time period for cash flow = 1 year

initial investment = 800.

$$NPV = \sum \left(\frac{1000}{(1+0.12)^{\wedge} 1} \right) - 800$$

$$= \frac{1000}{1.12} - 800$$

$$= 892.85 - 800$$

NPV 92.86

Decision: Accept the Project (NPV > 0)

(3) You Invest ₹1000 now and expect to receive ₹1100 is one year. If the discount rate is 15% What is the NPV?

Ans// −43.48

Decision: Reject the Project (NPV < 0)

4) Two year inflow

You invest ₹1000 now and receive ₹1300 at the end of 2 years. The discount rate is 10%. What is the NPV?

$$NPV = \frac{1300}{(1+0.10)^2} - 1000$$

$$= \frac{1300}{1.21} - 1000 \qquad (1.10)^2 = 1.21$$

$$= 1074.38 - 1000$$

$$NPV = 74.38$$

Decision: Accept the project NPV > 0

5) Break even case:

Your invest ₹900 now and get back ₹990 in one year. If the discount rate is 10%. What is the NPV?

$$NPV = \frac{990}{(1+0.10)^1} - 900$$

$$= \frac{990}{1.10} - 900$$

$$= 900 - 900$$

$$= 0$$

$$NPV = 0$$

Decision: Accept or reject based on other considerations.

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(b) Higher Return Over longer Period

Investment = ₹ 4000

Return ₹ 6000 after 4 years

Discount rate 10%.

$$NPV = \frac{6000}{(1+0.10)^4} - 4000$$

$$= \frac{6000}{1.4641} - 4000$$

$$= 4097.49 - 4000$$

NPV = 97.49 98%.

Decision : Accept the Project NPV > 0

Advantages: (1) Considers Time Value
NPV Considers the time value of money
(2) Comprehensive:
Evaluates all cash flows over the Project's life.

Problems

(1). A Project requires an investment of ₹1,00,000 and generates cash inflows of ₹30,000 ₹40,000 and ₹50,000 over 3 years. Calculate the NPV at a discount rate of 10%.

NPV = Σ (CFt / (1+r)^t) - initial investment
Expected cash inflows (CFt) = 30000, 40000, 50000
Discount Rate = 10% $\frac{10}{100}$ 0.10
(t) Time Period of each Cash inflows } = 1, 2, 3.
^ = Power.

= 30000 / (1+0.10)^1 + 40000 (1+0.10)^2 + (50000 / (1+0.10)^3

⇒ 30000 / (1.10 X 1) + 40000 (1.10 X 2) + ₹50000 / (1.10 X 3) - 1,00,000

= $\frac{20000}{1.10} + \frac{40000}{1.21} + \frac{50000}{1.331}$

27273 + 33057 + 37565 - 100000

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⇒ 97895 − 100000

⇒ −2105

NPV = −.2105

(5) A company is considering a project with an initial investment of ₹50000 and expected cash inflows of ₹20000 per year for 5 years. Calculate the NPV at a discount rate of 12%

$$NPV = \sum \left(CF_t / (1+r)^{N_t} \right) - \text{Initial investment}$$

⇒ 20000/(1+0.12)^1 + 20000/(1+0.12)^2 + 20000/(1+0.12)^3 + 20000/(1+0.12)^4 + 20000/(1+0.12)^5 − 50000

⇒ 20000/1.12 + 20000/1.2544 + 20000/1.404928 +

= 17857 + 15944 + 14235

20000/1.573519 + 20000/1.762341 − 50000

= 12710 + 11348

= 72094 − 50000

NPV = ₹ 22094

IRR – Internal Rate of Return

The Internal Rate of Return (IRR) is the discount rate that makes the Net Present Value (NPV) = 0 for a Project or investment.

Formula: (Conceptual)

$$0 = \sum_{t=0}^{n} \frac{C_t}{(1+IRR)^t} - \text{Initial investment}$$

C_t = Cash flow at time t

IRR = Internal rate of return

t = time period

Decision Rule

IRR > required rate of return → Accept the project

IRR < required rate of return → Reject the project

1) Single Cash Flow (one year Project)

You invest ₹1000 today and receives ₹1200 after 1 year. What is the IRR?

$$0 = \frac{1200}{(1+IRR)^1} - \text{initial investment}$$

$$\Rightarrow \frac{1200}{(1+IRR)^1} - 1000$$

$$1000 = \frac{1200}{(1+IRR)^1}$$

$$(1+IRR)^1 = \frac{1200}{1000} = 1.2 \qquad IRR = 1 - 1.2$$

$$= 0.2$$

$$= 0.2 \times 100\%$$

$$= 20\%$$

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(2) You invest ₹ 1,000 today and receive ₹ 1150 after 1 year. What is IRR?

$$NPV = \frac{C_t}{(1+IRR)^t} - \text{Initial investment}$$

$$\Rightarrow \frac{1150}{(1+IRR)^1} - 1000$$

$$\frac{1150}{(1+IRR)^1} = 1000$$

$$(1+IRR)^1 = \frac{1150}{1000}$$

$$(1+IRR)^1 = 1.15$$

$$(1+IRR)^1 = 1.15$$

$$IRR = 1.15 - 1$$

$$= 0.15 \times 100$$

$$IRR = 15\%$$

(1) Two year investment

Investment = ₹ 2000

Returns ₹ 2500 in year 1, ₹ 900 in year 2

Find IRR if discount rate is 10%

$$NPV \text{ Formula} = \frac{C_t}{(1+IRR)^t} - \text{initial investment}$$

$$= \frac{2500}{(1+IRR)^1} + \frac{2500}{(1+IRR)^2} - 2000$$

$$PV_1 = \frac{2500}{(1+0.10)^1} = \frac{2500}{1.10} = 2272.73$$

$PV_2 = \frac{8000}{(1+0.10)^2} = \frac{8000}{1.21} = 2479.34$

PV Total $= 2272.73 + 2479.34$
$= 4752.07$

NPV $= 4752.07 - 5000$
NPV $= -247.93$
Negative
The project should not be accepted.

Capital Budgeting : Methods Covered

(1) Payback Period
(2) Accounting Rate of Return
(3) Net Present Value (NPV)
(4) Initial Rate of Return (IRR)
(5) Profitability Index

(1) Payback Period:
A project requires an initial investment ₹ 4000. It generates ₹ 1000 per year for 5 years. What is the payback period

Payback Period = $\frac{\text{initial investment}}{\text{Annual cash flow.}}$
$= \frac{4000}{1000}$
$= 4$ years

② Accounting Rate of Return (ARR)

Initial investment ₹ 10,000
Annual Accounting Profit ₹ 1500
Project life = 5 years
What is the ARR?

$$ARR = \left(\frac{\text{Average Annual Profit}}{\text{initial investment}}\right) \times 100$$

$$= \left(\frac{1500}{10000} \times 100\right)$$

ARR = 15 %

③ Net Present Value (NPV)

initial investment ₹ 5000
Cash inflows - ₹ 2000 per year for 3 years
Discount rate = 10 %
Find NPV

$$NPV = \frac{CFT}{(1+r)^t} - \text{initial investment}$$

$$= \frac{2000}{(1+0.10)^t} - 5000$$

$$= \frac{2000}{(1+0.10)^1} + \frac{2000}{(1+0.10)^2} + \frac{2000}{(1+0.10)^3} - 5000$$

$$= 1818.18 + 1652.89 + 1502.63 - 5000$$

$$= -26.30$$

Reject (NPV < 0)

④ Initial Rate of Return (IRR)

initial investment = ₹ 2000

Returns = ₹ 2400 in 1 year.

Find IRR

$$P = \frac{C_t}{(1+IRR)^t} - \text{Initial investment}$$

$$= \frac{2400}{(1+IRR)} - 2000 \Rightarrow \frac{2400}{(1+IRR)} = 2000$$

$$= (1+IRR) = \frac{2400}{2000}$$

$1 + IRR = 1.2$

$IRR = 1 - 1.2$

$= -0.2$

Convert into percentage

$IRR = 20\%$

⑤ Profitability Index (PI)

$$PI = \frac{\text{PV of future inflows}}{\text{Initial Investment}}$$

a) initial investment = 5000

Present Value of future inflows = 6500

Find profitability index

$$PI = \frac{6500}{5000}$$

$= 1.3$

Accept the project (PI) > 1.

b) Investment = ₹ 80,000 Present Value of future Cash flows = 100000

$$PI = \frac{\text{PV of future inflows}}{\text{Initial investment}}$$

$$= \frac{1,00,000}{80,000} = 1.25$$

PI = 1.25 - Project is acceptable

PI > 1

2) A I. Payback Period Method.

A company invut ₹ 50,000 in a Project. that is expected to generate ₹ 12500 annually. for 5 years. What is the Payback Period?

$$\text{Payback period} = \frac{\text{initial investment}}{\text{Annual Cash flow}}$$

Given: Initial investment = 50000

Annual Cash flow. = 12500.

$$= \frac{50000}{12500.}$$

= 4 years.

Net Present Value (NPV) Method.

A project requires an initial investment ₹ 20000 and is expected to generate ₹ 8000. per year 3 years.. If the discount rate is 10 %. What is the NPV?

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$$NPV = \sum \left(\frac{\text{Cash inflow.}}{(1+r)^t} \right) - \text{initial investment}$$

CFT = 8000 $r = 10\%$ $t = 3$ years investment = 20000

$$= \frac{8000.}{(1+0.10)^{\wedge 3}} - 20000$$

$$= 19894.82 - 20000$$

$$\Rightarrow -105.18$$

$NPV < 0$

$-105.18 < 0$

Decision: Negative NPV means the Porject is not financially visible.

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iii. Internal Rate of Return (IRR)

A company invests ₹ 10000 in a Project that returns 4000 annually for 3 years. What is the IRR (Approximate)

$$0 = \frac{Ct}{(1+IRR)} - \text{initial investment}$$

Ct = 4000 investment = 10000

$$0 = \frac{4000}{(1+IRR)} - 10000$$

$$1 + IRR = \frac{4000}{10000}$$

$$1 + IRR = 0.4$$

$$IRR = 1 - 0.4$$

$$IRR = -0.6$$

Convert into Percentage

IRR = 60%.

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IV Profitability Index (PI)

If a Project Cost ₹ 25,000 and the Present Value of future Cash flows is ₹ 30,000 What is the Profitability Index?

$$PI = \frac{\text{Present value of cash inflows}}{\text{Initial investment}}$$

Present value of future cash flow = 30000 Project cost = 25000 investment

$$= \frac{30000}{25000}$$

$$= 1.2$$

$PI = 1.2$

$PI > 1$

Project Acceptable.

IV ARR :

A company invests ₹ 50000 in a project. The expected annual accounting Profit is ₹ 6000. What is the ARR?

$$ARR = \frac{\text{Average Annual Profit}}{\text{Initial Investment}} \times 100$$

$$= \frac{6000}{50000} \times 100$$

$ARR = 12\%$