Capital Budgeting Techniques

Capital Budgeting Evaluation techniques

Traditional Techniques

- Payback period
- Accounting rate of Return (ARR)

Modern techniques

- Net Present Value (NPV)
- Profitability Index (PI)
- Internal Rate of return (IRR)
- Discounted payback period
- Terminal value
- Modified IRR (MIRR)

Accounting rate of Return (ARR)

- Accounting rate of Return (ARR): ARR Method is based on Return on investment concept.
- Computation of ARR

When he profit after tax to be earned every year are equal

ARR= (Annual profit (after tax) /Average investment in the project)*100

When the profit after tax to be earned every year are different

ARR= (Average Annual profit (after tax) /Average investment in the project)*100

Note:

Average Annual profit (After tax) = Sum of the annual profit(After tax) for the whole life/ life span of the project in years

Average Investment= Initial cost of the project+ Installation expenses

Average Investment= 1/2(Initial cost +Installation cost-SV)+SV+ Additional wc

Accounting rate of Return (ARR)

ARR

Accept/ Reject Rule

IF ARR> Pre specified or desired rate of return
ACCEPT THE PROJECT

IF ARR<Pre specified or desired rate of return
REJECT THE PROJECT

Payback period

Payback Period Method

- Payback Period is the length of time required to recover the initial investment made in a project.
- Payback Period is the duration of time required to equal the cumulative cash inflows to it's cash outflows.

Calculation of Pay back period

when equal cash inflows are generated every year

Payback period: initial investment/ Annual cash inflow

Initial Cash Outflow or Initial Investment	Life	Annual Cash Inflows
50000	5 years	12500
Payback Period= 50000/12500= 4 years		

Payback period

Calculation of Pay back period

when unequal cash inflows are generated every year which means there is mixed stream of cash inflows.

Payback Period = No. of years immediately preceding the year of recovery+ (Balance amount to be recovered in the year of final recovery/Cash inflow in the year of the final recovery)

Example Calculate payback period

	0	1	2	3	4	5
Outflow	**40000**					
Inflows		**10000**	**12000**	**10000**	**7000**	**5000**

Payback period

Computation of Cumulative cash Inflow		
Years	Cash inflows	Cumulative
1	10000	10000
2	12000	22000
3	10000	32000
4	7000	39000
5	5000	

Payback period= 4+ balance amount left to be recovered in the year of final recovery/cash inflow of the year of the final recovery

= 4+ 1000/5000

=4.2 years

Payback period

Payback Period

Accept/ Reject Rule

IF Payback Period< Predetermined or desired Payback Period
ACCEPT THE PROJECT

IF Payback Period> Pre specified or desired Payback period
REJECT THE PROJECT

Net Present Value (NPV)

Net Present Value (NPV)

NPV is the difference between the PV of cash inflows and PV of cash outflows of a project.

$$NPV = \sum_{i=1}^{n} \frac{Cash\ Flow_i}{(1+r)^i} - Initial\ Investment$$

$$NPV = -C_0 + \frac{C_1}{1+r} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_T}{(1+r)^T}$$

$-C_0 = Initial\ Investment$
$C = Cash\ Flow$
$r = Discount\ Rate$
$T = Time$

Net Present Value (NPV)

Accept/ Reject Rule

When NPV>0 OR positive

ACCEPT THE PROJECT

When NPV<0 OR Negative

REJECT THE PROJECT

Profitability Index

- Profitability Index: it is the ratio of present value of all cash inflows associated with a project to the present value of its cash outflows.

$$PI = \frac{PV_{CASH\ INFLOWS}}{PV_{CASH\ OUTFLOWS}}$$

- Accept/Reject Rule

When PI>1 Accept

When PI<1 Reject

Internal Rate of Return

- IRR is defined as the discount rate which equates the present value of expected net cash inflows from an investment proposal to the present value of its initial cash outflows.

$$0 = CF_0 + \frac{CF_1}{(1+IRR)} + \frac{CF_2}{(1+IRR)^2} + \frac{CF_3}{(1+IRR)^3} + \ldots + \frac{CF_n}{(1+IRR)^n}$$

Or

$$0 = NPV = \sum_{n=0}^{N} \frac{CF_n}{(1+IRR)^n}$$

Where:
CF_0 = Initial Investment / Outlay
$CF_1, CF_2, CF_3 \ldots CF_n$ = Cash flows
n = Each Period
N = Holding Period
NPV = Net Present Value
IRR = Internal Rate of Return

Internal Rate of Return

Hence at IRR

- PV of Net Cash inflows-PV of Cash outflows = 0
- FURTHER IRR is defined as

PV of Net cash inflows/ PV of cash Outflows = 1

- IRR can be defined as the discount rate at which NPV of an Investment is Zero.
- IRR can be defined as the discount rate or rate of return at which PI index or Benefit Cost ratio is equal to 1.

Internal Rate of Return

Steps for computing IRR when Annual net cash inflows are equal:

- Calculate Payback period of the project

Payback period: initial investment/ Annual cash inflow

- Find the discount factors closest to payback period value against the life period row of the project and interest rate thereof.
- Look at annuity table and find two values one smaller and other greater than calculated payback period.
- Find Interest rate corresponding to these two values and apply formula

Internal rate of return

(iv) Determine the actual IRR by interpolation using the following formula:

$$IRR = r + \left(\frac{DF_r - PB}{DF_{rL} - DF_{rH}} \right) \times \Delta r$$

Where, r = Either of the two interest rates (rL *or* rH)

DF_r = Discount factor at r (Either DF_{rL} *or* DF_{rH})

PB = Payback period

DF_{rL} = Discounting factor at lower interest rate

DF_{rH} = Discounting factor at higher interest rate

Δr = Difference in interest rates ($rH - rL$)

Internal Rate of Return

- When Annual Net Cash inflows are unequal
- Calculate average annual cash flow to determine the fake annuity and fake payback period.
- Fake Payback period = Initial Investment / Average annual CFAT
- Find the discount factors closest to fake payback period value against the life period row of the project and interest rate thereof.
- Look at annuity table and find two values one smaller and other greater than calculated fake payback period.
- Find Interest rate corresponding to these two values and apply formula

Internal Rate of Return

IRR of the project can be calculated through interpolation by using the following formula:

$$IRR = r + \left(\frac{NPVr}{NPV_{rL} - NPV_{rH}} \right) \times \Delta r$$

Or

$$= r + \left(\frac{NPV_r}{\Delta NPV} \right) \times \Delta r$$

Where, r = Either of the two interest rates (rL *or* rH)

NPV_r = Net present value of the project at 'r' rate of interest

NPV_{rL} = Net present value of the project at lower interest rate (where the NPV is positive)

NPV_{rH} = Net present value of the project at higher interest rate (where the NPV is negative)

ΔNPV = Difference of NPVs of the project at rL and rH ($NPV_{rL} - NPV_{rH}$)

Δr = Difference in interest rates ($rH - rL$)

Internal Rate of Return

Internal Rate of Return(IRR)

Accept/ Reject Rule

IF IRR>required rate of return or cost of capital
ACCEPT THE PROJECT

IF IRR<required rate of return or cost of capital
REJECT THE PROJECT