

SEMESTER – B.Com, SEMESTER 6

SUBJECT – FINANCIAL MANAGEMENT

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LECTURE NO. – 5

CAPITAL BUDGETING

cont...

Note: We understand you may not have access to library books in the lock down period, hence if you want to solve more problems, and want to see some more examples, let me know. You can also whatsapp me at 9163019220 if you are interested in getting scanned copy of more problems and solutions on capital budgeting.

IRR vs. NPV:

Comparison of both the techniques (similarities)

1. Both techniques use Discounted Cash Flow (DCF) method.
2. Both recognize the time value of money.
3. Both take into account the cash flows over the entire life of the project.
4. Both are consistent with the objective of maximizing the wealth of shareholders.
5. Both are difficult to calculate.
6. Both techniques may often give contradictory result in the case of alternative proposals which are mutually exclusive.

Contrast, i.e. Points of difference

(i) Interest Rate: NPV uses the firm's cost of capital as Interest Rate. Unless the cost of capital is known, NPV method cannot be used. Calculating cost of capital is not required for computing IRR.

(ii) NPV may mislead when dealing with alternative projects or limited funds under the conditions of unequal lives. IRR allows a sound comparison of the project having different lives and different timings of cash inflows.

(iii) NPV may give different ranking in case of complicated projects as compared to IRR method.

(iv) NPV assumes that intermediate cash flows are re-invested at firm's cost of capital whereas IRR assumes that intermediate cash inflows are reinvested at the internal rate of the project.

(v) The results of IRR method may be inconsistent compared to NPV method, if the projects differ in their (a) expected lives or (b) investment or (c) timing of cash inflow.

(vi) IRR method favours short-lived project so long as it promises return in excess of cut-off rate whereas NPV method favours long-lived projects.

(vii) Sometimes IRR may give negative rate or multiple rates. NPV does not suffer from the limitation of multiple rates.

Recommendation:

The NPV method is generally considered to be superior theoretically because:

- (i) It is simple to calculate as compared to IRR.
- (ii) It does not suffer from the limitation of multiple rates.
- (iii) NPV assumes that intermediate cash flows are reinvested at firm's cost of capital. The reinvestment assumption of NPV is more realistic than IRR method.

But IRR method is favoured by some scholars because:

- (i) It is easier to visualize and to interpret as compared to NPV.
- (ii) Even in the absence of cost of capital, IRR gives an idea of project's profitability. Note: Unless the cost of capital is known, NPV cannot be used.
- (iii) They think IRR method is preferable to NPV in the evaluation of risky projects.

Discounted Pay Back Method:

Under this method the discounted cash inflows are calculated and where the discounted cash flows are equal to original investment then the period which is required is called discounting pay back period. While calculating discounting cash inflows the firm's cost of capital has been used.

Formula: Discounted payback period (DPP) = Investment / Discounted Annual cash inflow

DECISION CRITERIA:

Out of two projects, selection should be based on the period of discounting pay back period (Lesser pay back period should be preferred.)

Example 10

A limited company is considering investing a project requiring a capital outlay of ₹ 2,00,000. Forecast for annual income after depreciation but before tax is as follows:

Year	₹
1	1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000

Depreciation may be taken as 20% on original cost and taxation at 50% of net income. You are required to evaluate the project according to each of the following methods:

- (a) Pay-back method
- (b) Rate of return on original investment method
- (c) Rate of return on average investment method
- (d) Discounted cash flow method taking cost of capital as 10%
- (e) Net present value index method
- (f) Internal rate of return method

Solution:

Working Notes:

Year	Profit before tax	Profit after tax @ 50%	Cash inflows after tax [PAT + Dep]	Cumulative cash inflows	Discounting factor @ 10%	Present Value	Discounting factor @ 20%	Present value @20%	Discounting factor @ 30%	Present Value @30%	Discounting factor @ 32%	Present value @32%
1	1,00,000	50,000	90,000	90,000	0.9091	81,819	0.8333	74,997	0.7692	69,228	0.7576	68,184
2	1,00,000	50,000	90,000	1,80,000	0.8264	74,376	0.6944	62,496	0.5917	53,253	0.5739	51,651
3	80,000	40,000	80,000	2,60,000	0.7513	60,104	0.5787	46,296	0.4552	36,416	0.4348	34,784
4	80,000	40,000	80,000	3,40,000	0.6830	54,640	0.4823	38,584	0.3501	28,008	0.3294	26,352
5	40,000	20,000	60,000	4,00,000	0.6209	37,254	0.4019	24,114	0.2693	16,158	0.2495	14,970
						3,08,193		2,46,487		2,03,063		1,95,941

(a) **Pay Back Method:**

From the cumulative cash inflow, we can understand that the pay back period lies between 2 and 3 years.

Pay back period = $2 + 20,000/80,000 = 2.25$ years (or) 2 years 3 months (to convert fraction in decimals into months multiple, .25 with 12, i.e. $.25 \times 12 = 3$ months)

(b) **Rate of Return on Original Investment Method.**

ARR = Average Profit after Tax / Original Investment x 100
 = $40,000 / 2,00,000 \times 100 = 20\%$

(c) **Rate of Return on Average Investment Method**

ARR = Average Profit after tax / Average investment x 100
 Average Profit = $Rs\ 200000/5 = Rs\ 40,000$
 Average investment = $(200000+0)/2 = Rs\ 100000$
 Therefore, ARR = $40,000 / 1,00,000 \times 100 = 40\%$

(d) **Discounted Cash Flow Method taking Cost of Capital as 10%**

Present value of cash inflows after tax	3,08,193
Less: Outflow	2,00,000
Net Present Value	1,08,193

(e) **Profitability Index**

Profitability Index = P.V of Cash Inflows / P.V of Cash Outflow = 3,08,193 / 2,00,000 = 1.54 Since PI is more than 1 it can accept the project.

(f) Internal Rate of Return Method

(g) Fake PBP = (Initial Investment/Average Annual cash flow) = 200000/80000=2.5

Referring to the PV of an annuity of one rupee table, we find the value of Re 1 after a period of 5 years considering a discounting rate of 25% is 2.68, hence the fake payback period of 2.5 lies much beyond 25%. So we have taken 30% as the discounting rate on a trial basis. The Discounted cash inflow @30% is 203063, hence to get DCIF below 200000, we have to increase the discounting rate and hence we took 32%.

Discounting Rate	NPV
30%	3063
➤ IRR	0
32%	-4059

Applying interpolation:

$$\frac{\text{IRR}-0.30}{0.32-0.30} = \frac{0-3063}{-4059-3063}$$

$$\frac{\text{IRR}-0.30}{0.02} = \frac{-3063}{-7122}$$

$$\text{IRR} = .0086 + 0.30 = .3086 \text{ or } 30.86\%$$

Example 11

Bisk-Farm Biscuits Ltd is considering the purchase of a delivery van, and is evaluating the following two choices:

- (a) The company can buy a used van for ` 20,000 and after 4 years sell the same for ` 2,500 (net of taxes) and replace it with another used van which is expected to cost ` 30,000 and has 6 years life with no terminating value,
- (b) The company can buy a new van for ` 40,000. The projected life of the van is 10 years and has an expected salvage value (net of taxes) of Rs 5,000 at the end of 10

years. The services provided by the vans under both the choices are the same. Assuming the cost of capital at 10 percent, which choice is preferable?

Solution: Calculation of mutually exclusive decision

Alternative I : Company purchased a used van

Calculation of PV of cash outflow:

₹

Year	Cash outflow	PV factor at 10%	Present Value
t_0	20,000	1	20,000
t_4	27,500 (30,000-2,500)	0.6830	18,783
PV of total cash outflow under Alternative I			38,783

Alternative II : Company purchased a new van

Year	Cash outflow	PV factor at 10%	Present Value
t_0	40,000	1	40,000
t_{10}	(5,000)	0.3855	(1,928)
PV of net cash outflow			38,072

Comment: It is advised to select alternative II as it involves lower cash outflows.

Example 12

Following are the data on a capital project being evaluated by the management of X Ltd.:

	Project M
Annual cost saving	₹ 40,000
Useful life	4 years
I.R.R	15%
Profitability Index (PI)	1.064
NPV	?
Cost of capital	?
Cost of project	?
Pay back	?
Salvage value	0

Find the missing values considering the following table of discount factor only:

Discount Factor	15%	14%	13%	12%
1 year	0.869	0.877	0.885	0.893
2 years	0.756	0.769	0.783	0.797
3 years	0.658	0.675	0.693	0.712
4 years	0.572	0.592	0.613	0.636
	2.855	2.913	2.974	3.038

Solution:

Annual cash inflow (saving)= 40,000

Life = 4 years

IRR = 15%

PI = 1.064

At 15% IRR

PV of cash inflow = Cost of project

40,000 PVAF 4 yrs 15% = Cost of project

Cost of Project = 40,000 x 2.855 = Rs 1,14,200

PI = PV of cash inflow / Initial outflow

= 1.064

Now, 1.064 = PV of cash inflow / 1,14,200

PV of cash inflow = 1,21,509

Less: Outflow = 1,14,200

NPV = 7,309

At cost of capital

Let r be the Cost of Capital (K_0)

PV of cash inflow 40,000 PVAF r% 4 yrs = 1,21,509

PVAF n% 4 yrs = 1,21,509 / 40,000 = 3.038

r = 12%

Pay back period = Initial Investment / Annual cash flow = 1,14,200 / 40,000 = 2.855