Finance Management

Module 4: Capital Budgeting

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Capital Budgeting

What is Capital Budgeting?

- Capital budgeting is a strategic asset allocation.
- It is capital expenditure (or capital investment or capital project) that involves a current outlay and/or future outlays of funds in the expectation of a stream of benefits extending far into future.
- Capital budgeting can be defined as a process of evaluating investments and huge expenses in order to obtain the best returns on investment.
- For example, expenditure which is always in asset side, in the form of investment in a new plant or a major R&D or computerization/updating the plant etc. comes under capital budgeting.
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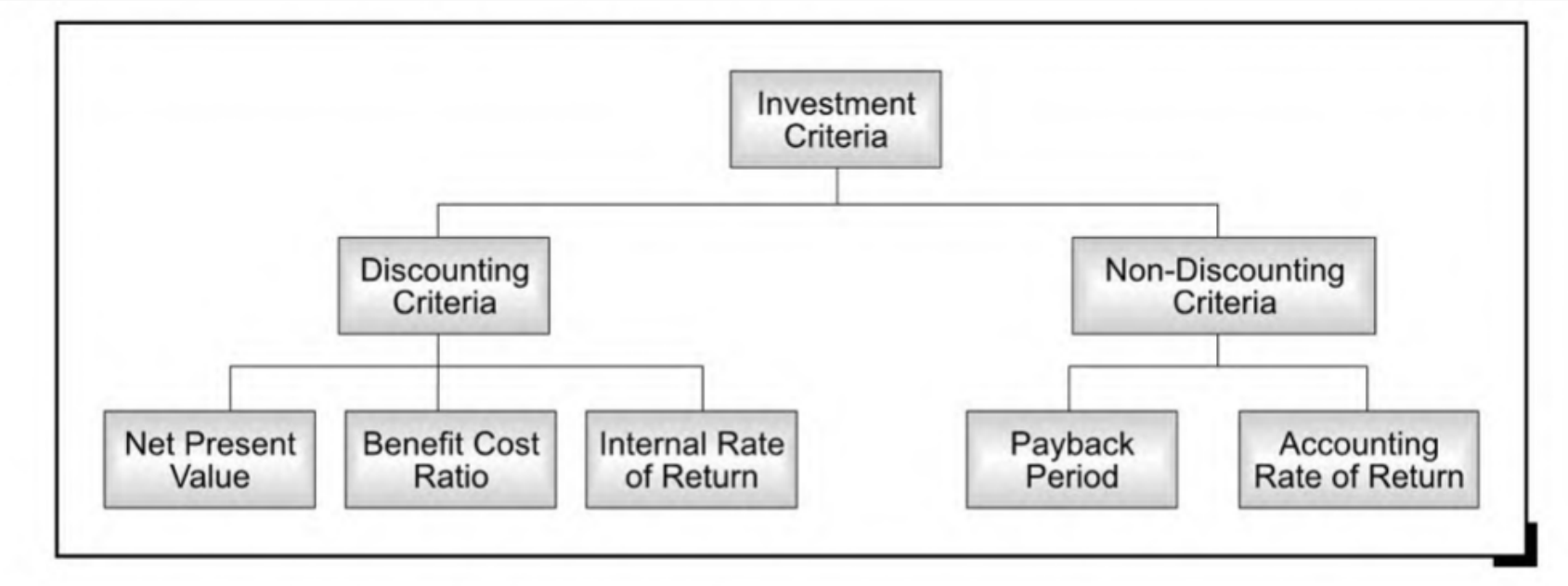
Importance of Capital Budgeting

- Capital budgeting is a process that helps in planning the investment projects of an organization in long run.
- It is very important for any business as it impacts the growth & prosperity of the business in the long term.
- It also creates accountability & measurability.
- It takes all possible consideration into account so that the company can evaluate the profitability of the project.
- It is useful for evaluating capital investment project such as purchasing equipment, the rebuilding of equipment etc.
- The benefit from an investment may be in form of a reduction in cost or in form of increased revenue.
- Importance of capital budgeting can be understood from its impact on the business.

Inputs to the Capital Budgeting Decision

- **Project's (or subsidiary's) perspective.**
  - *Initial cash flow*, which is the sum of initial investment and net working capital (NWC).
  - *Free annual cash flow* from operations is the sum of Operating earnings After Tax (OEAT) and Depreciation (D) less Increase in NWC. i.e. it is (OEAT+D-Increase in NWC).
  - *Project life and Salvage value*. It suggests that how many years would the project produce cash flows. While Salvage value is estimated book value of an asset after depreciation is complete.
  - *The required rate of return*, which can be computed using Weighted Average Cost of Capital (WACC).
- Parent Company's Perspective
  - Initial cash flow.
  - Net annual cash flows to the parent from the subsidiary.
  - After tax salvage value and recovery of NWC.
  - Required rate of return from parent's perspective.

Investment Appraisal Criterion



Net Present Value(NPV)

- It is used to evaluate investment and financing decisions that involve cash flows occurring over multiple periods.
- The net present value (NPV) of a project is the sum of the present values of all the cash flows (in and out) that are expected to occur over the life of the project.
- NPV $>$ 0 indicates the project can be considered for investment, while NPV $<$ 0 is unworthy project.
- The general formula of NPV is,

$$NPV = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - \text{Initialinvestment}$$

Where, C_t is the cash flow at the end of year t, n is the life of the project and r is the discount rate.

Example

- Consider a project which has the following cash flow stream,

Year	*Cash flow*
0	Rs.(1,000,000)
1	200,000
2	200,000
3	300,000
4	300,000
5	350,000

- discount rate is 10%.

$$\text{NPV} = \frac{200,000}{(1.10)^1} + \frac{200,000}{(1.10)^2} + \frac{300,000}{(1.10)^3} + \frac{300,000}{(1.10)^4} + \frac{350,000}{(1.10)^5} - 1,000,000 = -5,272$$

Properties of NPV

Net Present Values are Additive The net present value of a package of projects is simply the sum of the net present values of individual projects included in the package. It has following implications

- The value of a firm can be expressed as, Value of the firm =$\sum$ sum of present value of projects+$\sum$ NPV ofexpected future projects.
- When a firm terminates an existing project which has a negative NPV based on its expected future cash flows, the value of the firm increases by that amount.
- Likewise, when a firm undertakes a new project that has a negative NPV, the value of the firm decreases by that amount.
- When a firm divests itself of an existing project, the price at which the project is divested affects the value of the firm. If the price is greater/lesser than the present value of the anticipated cash flows of the project, the value of the firm will increase/decrease with the divestiture.
- When a firm makes an acquisition and pays a price in excess of the present value of the expected cash flows from the acquisition it is like taking on a negative NPV project and hence will diminish the value of the firm.

- **Intermediate Cash Flows Are Invested at the Cost of Capital** i.e. The NPV rule assumes that the intermediate cash flows of a project i.e. cash flows that occur between the initiation and the termination of the projects are reinvested at a rate of return equal to the cost of capital.
- **NPV Calculation Permits Time Varying Discount Rates**.

$$NPV = \sum_{t=1}^{n} \frac{C_t}{\prod_1^t (1 + r_t)} - \text{Initial investment}$$

where r_t is the discount rate for the year t.

For example,

Discount rate	14%	15%	16%	18%	20%
Investment	– 12000				
Cash flow		4,000	5,000	7,000	6,000	5,000

The present value of the cash flows can be calculated as follows:

PV of C_1	= 4,000/1.14	= 3509
PV of C_2	= 5,000 / (1.14 * 1.15)	= 3814
PV of C_3	= 7,000 / (1.14 * 1.15 * 1.16)	= 4603
PV of C_4	= 6,000 / (1.14 * 1.15 * 1.16 * 1.18)	= 3344

PV of C_5	= 5,000 / (1.14 * 1.15 * 1.16 * 1.18 * 1.20)	= 2322
NPV of project	= 3509 + 3814 + 4603 + 3344 + 2322 – 12000	= Rs.5592

Limitations of NPV

- The NPV is expressed in absolute terms rather than relative terms and hence does not factor in the scale of investment. e.g. A project-A has an NPV of Rs.5,000 and project-B has an NPV of Rs.2,500, but project A may require an investment of Rs.50,000 where as project B may require an investment of just Rs.10,000.
- The NPV rule does not consider the life of the project. Hence, when mutually exclusive projects with different lives are being considered, the NPV rule is biased in favour of the longer term project.

Benefit Cost Ration (BCR)

- It is given by,

$$BCR = \frac{PVB}{I}$$

- Net benefit cost ratio (NBCR) is given by,

$$NBCR = \frac{PVB - I}{I} = BCR - 1$$

where, PVB is the present value of benefits and I is the initial investment.

- If $BCR > 1$ ($NBCR > 0$) then accept the project else reject.
- For instance, consider a project which is being evaluated by a firm that has a cost of capital of 12 percent and;

Initial investment:		Rs.100,000
Benefits:	Year 1	25,000
	Year 2	40,000
	Year 3	40,000
	Year 4	50,000

Advantage of BCR ove NPV

$$BCR = \frac{\frac{25,000}{(1.12)} + \frac{40,000}{(1.12)^2} + \frac{40,000}{(1.12)^3} + \frac{50,000}{(1.12)^4}}{100,000} = 1.145$$

$$NBCR = BCR - 1 = 0.145$$

- Advantage: The proponents of benefit-cost ratio argue that since this criterion measures NPV per rupee of outlay, it can discriminate better between large and small investments and hence is preferable to the net present value criterion.

internal Rate of Return

- The internal rate of return (IRR) of a project is the discount rate which makes its NPV equal to zero.
- i.e. It is r when $NPV = 0$ or PVB=Initial Investment.
- So we can compute it from,

$$I = \sum_{t=1}^{n} \frac{C_t}{(1 + r_t)^t}$$

- Accept :If the IRR is greater than the cost of capital (required returns).
- Reject :If the IRR is less than the cost of capital.

Example

Year	0	1	2	3	4
Cash flow	(100,000)	30,000	30,000	40,000	45,000

The IRR is the value of r which satisfies the following equation:

$$100{,}000 = \frac{30{,}000}{(1+r)^1} + \frac{30{,}000}{(1+r)^2} + \frac{40{,}000}{(1+r)^3} + \frac{45{,}000}{(1+r)^4}$$

try $r = 15$ percent. This makes the right-hand side equal to:

$$\frac{30{,}000}{(1.15)^1} + \frac{30{,}000}{(1.15)^2} + \frac{40{,}000}{(1.15)^3} + \frac{45{,}000}{(1.15)^4} = 100{,}802$$

$$\frac{30{,}000}{(1.16)^1} + \frac{30{,}000}{(1.16)^2} + \frac{40{,}000}{(1.16)^3} + \frac{45{,}000}{(1.16)^4} = 98{,}641$$

Since this value is now less than 100,000, we conclude that the value of r lies between 15 percent and 16 percent. For most of the purposes this indication suffices.

Problems with IRR

There are problems in using IRR when the

1. Cash flows of the project are not conventional
2. Two more projects are being compared to determine which one is the best.

- **Non-conventionalCashFlows** : If cash flows are not conventional then it is difficult to define 'what is IRR'. For example, project has a positive NPV for all discount rates and hence no IRR. Another example,

	Cash flow		
Project	C_0	C_1	C_2
M	– 160,000	+ 1,000,000	– 1,000,000

The IRR equation for this cash flow stream is:

$$-160{,}000 + \frac{1{,}000{,}000}{(1+r)} - \frac{1{,}000{,}000}{(1+r)^2} = 0$$

- This equation is satisfied with $r = 25\%$ and $r = 45\%$. Which one to choose? is the problem.

Problems with IRR

- **Mutually Exclusive Projects :** Often firms have to choose from two or more mutually exclusive projects. In such cases IRR can be misleading.
- For example,

	Cash flow		*IRR*	*NPV*
Project	C_0	C_1		*(assuming r = 12percent)*
P	– 10,000	20,000	100%	7,857
Q	– 50,000	75,000	50%	16,964

Modified IRR

- To overcome the shortcomings of the IRR, one can use modified IRR that can be computed from the the equation,

$$PVC = \frac{TV}{(1 + MIRR)^n}$$

Where, PVC is present value of the cost given by

$$PVC = \sum_{t=0}^{n} \frac{\text{Cash Outflow}_t}{(1 + r)^t}$$

and TV is terminal value of the cash in flows expected from the project, given by

$$TV = \sum_{t=0}^{n} (\text{Cash inflow}_t)(1 + r)^{n-t}$$

Example

Year	*0*	*1*	*2*	*3*	*4*	*5*	*6*
Cash flow	–120	– 80	20	60	80	100	120

The cost of capital for Pentagon is 15 percent. The present value of costs is:

$$120 + \frac{80}{(1.15)} = 189.6$$

The terminal value of cash inflows is:

$$20(1.15)^4 + 60(1.15)^3 + 80(1.15)^2 + 100(1.15) + 120$$

$$= 34.98 + 91.26 + 105.76 + 115 + 120 = 467$$

The MIRR is obtained as follows:

$$189.6 = \frac{467}{(1+\text{MIRR})^6}$$

$$(1 + \text{MIRR})^6 = 2.463$$

$$1 + \text{MIRR} = 2.463^{1/6} = 1.162$$

$$\text{MIRR} = 1.162 - 1 = 0.162 \text{ or } 16.2 \text{ percent}$$

NPV vs IRR vs MIRR

- MIRR is better than the regular IRR in measuring the true rate of return.
- However, for mutually exclusive projects of different size, NPV is a better alternative in measuring the contribution of each project to the value of the firm.

Payback Period

The pay back period is the length of time required to recover the initial cash outlay on the project.

- For example, For example, if a project considers cash outlay of Rs.1000000 and it generates cash inflows of Rs.200000, Rs.200000,Rs.300000 and Rs. 300000 in the first, second, third, and fourth years, respectively, its payback period is 4 years because the sum of cash in flows during 4 years is equal to the initial outlay.
- When the annual cash in flow is a constant sum, the payback period is simply the initial outlay divided by the annual cash inflow.
- For example, a project has an initial cash outlay of Rs. 1500000 with a constant annual cash inflow of Rs. 400000. Then payback period is $1500000/400000 = 3.75$ years.

Payback Period

As an investment criterion, the payback period seems to offer the following advantages:

- It is simple, both in concept and application. It does not use involved concepts and tedious calculations and has only few hidden assumptions.
- It is a rough and ready method for dealing with risk.
- It favors projects which generate substantial cash inflows in earlier years and discriminates against projects, which bring substantial cash inflows in later years but not in earlier years. Now, if risk tends to increase with futurity-in general,this may be true the payback criterion may be helpful in weeding out risky projects.
- Since it emphasizes earlier cash inflows, it may be a sensible criterion when the firm is pressed with problems of liquidity.