

Unit 9 Capital Budgeting

QN1 Briefly explain the of Net Present Value (NPV) criterion of capital budgeting and its relative merits and demerits.

The net present value of an investment proposal may be defined as the sum of the present values of all the cash inflows less the sum of the present values of all of the cash outflows associated with the proposal.

Mathematically,

$$\begin{aligned} \text{NPV} &= \frac{CF_1}{(1+k)^1} + \frac{CF_2}{(1+k)^2} + \dots + \frac{CF_n}{(1+k)^n} - CF_0 \\ &= \sum_{t=1}^n \frac{CF_t}{(1+k)^t} - CF_0 \\ &= CF \times \text{PVIFA}_{k\%, n} - CF_0 \end{aligned}$$

Where, CF_1 , CF_2 and CF_n are expected net cash flow in the first, second and nth year. CF_0 is initial investment, and k is the cost of capital.

Decision rule

If the net present value of the project is positive, the project should be accepted and rejected if the net present value is negative. In case of ranking of mutually exclusive projects, the project with the highest positive NPV is given the first priority and the project with the lowest positive NPV is assigned the last in priority.

Advantages

- It considers the time value of money.
- NPV uses cash flows rather than the accounting profit. Cash flows are subjective than profits.
- It is consistent with the firm's goal of shareholder wealth maximization.

Disadvantages

- It involves difficult calculations.
- The NPV technique requires the predetermination of the required rate of return (k) which itself is a difficult job. If the value of k is not correct, then the NPV may be wrong.
- The NPV technique does not provide a measure of project's own rate of return.

QN2 Briefly explain the Internal Rate of Return (IRR) criterion of capital budgeting and its relative merits and demerits.

Internal rate of return (IRR)

The IRR is the interest rate that equates the present value of the expected future cash flows or receipts to the initial outlay. In this technique, the future cash inflows are discounted in such a way that their total present value is just equal to the present value of total cash outflows. Mathematically, it is determined by solving the IRR from the following equation:

$$\begin{aligned} \frac{CF_1}{(1+IRR)^1} + \frac{CF_2}{(1+IRR)^2} + \dots + \frac{CF_n}{(1+IRR)^n} - CF_0 &= 0 \\ \text{i.e. } \sum_{t=1}^n \frac{CF_t}{(1+IRR)^t} - CF_0 &= 0 \end{aligned}$$

Decision rule

The project may be accepted if its IRR is greater than required rate of return (also known as cost of capital or cut off rate or hurdle rate), otherwise rejected. In case of ranking of mutually exclusive projects, the project with highest IRR is given the first priority while the project with lowest IRR is given the last priority.

Advantages

- The IRR technique takes into account the time value of money.
- Consider all cash flows.
- Generally, consistent with wealth maximization principle.

Disadvantages

- IRR involves a tedious and complicated trial and error procedure.
- IRR technique makes an implied assumption that the future cash inflows of a proposal are reinvested at a rate equal to the IRR.
- It produces multiple IRR which can be confusing.
- Projects selected based on higher IRR may be profitable.
- Does not hold the value additive principle.

QN3 Briefly explain the Pay Back Period (PBP) criterion of capital budgeting and its relative merits and demerits.

The payback period is the number of required time period to recover the initial investment. The payback period therefore, can be looked upon as the length of time required for a proposal to break even on its net investment. The payback period can be calculated in two different situations.

When annual cash inflows are equal:

$$\text{Payback period} = \frac{\text{Initial outlay}}{\text{Annual cash flow}}$$

When the annual cash inflows are unequal: In case the cumulative cash inflows are used to compute the payback period.

$$\text{Payback period} = \text{Minimum year} + \frac{\text{Amount to recover}}{\text{Cash flow during the year}}$$

Where,

Amount to recover = Investment – minimum year's cumulative cash flow

Decision rule: If the payback period is greater than the target payback period, then the proposal should be rejected, it may be accepted if the payback period is less than the target period.

Advantages

- The payback period is simple and easy to understand, in concept as well as in its applications.
- It gives an indication of liquidity. The payback period is good method to adopt as it emphasizes the earlier cash inflows.
- The payback period deals with the risk. The project with a shorter payback period will be risky as compared to project with a longer payback period.

Disadvantages

- The payback period ignores the time value of money. It considers the cash flows occurring at different point of time as equal in money worth and ignores the time value of money.
- The payback period entirely ignores many of the cash inflows which occur after the payback period.
- Difficulties in determining the maximum acceptable payback period.
- The payback period is not consistent with the objective of maximizing the market value of the firm's shares.

QN4 What is capital budgeting? How classification can be done for various projects?

Capital budgeting may be defined as the decision making process by which firms evaluates the purchase of major fixed assets, including buildings, machinery and equipment. Capital budgeting describes the firm's formal planning process for the acquisition and investment of capital and results in a capital budget that is the firm's formal plan for the expenditure of money to purchase fixed assets.

Classification of capital projects

Independent projects: Projects are said to be independent when the acceptance of one does not prevent acceptance of others. Management may decide to undertake all available independent projects, or invest in only a selection or even implement none.

Contingent projects: Contingent projects are dependent projects; the choice of one project necessities undertaking one or more other projects. For example, if a company decides to build a factory in a remote area, it may have to invest in houses, roads, hospitals, schools etc. for employees to attract the work force.

Mutually exclusive projects: Projects are said to be mutually exclusive when the acceptance of one eliminates the other(s). It is an either or choices of project – the projects are in fact substitutes for each other. Projects may be mutually exclusive because they fulfill the same function.

Replacement projects: Companies routinely invest in equipments to replace obsolete and inefficient equipments. The objective of such investments is to reduce cost, increase return, and improve quality.

Expansion of the business: A company may add capacity to its existing product lines to expand existing operations. For example, a fertilizer company may increase its plant capacity to manufacture more urea.

Diversification projects: The firm may be interested to diversify into new product lines, new markets, production of spare parts etc. In such a case, the financial manager is required to evaluate not only the marginal cost and benefits, but also the effect of diversification on the existing market share and profitability.

QN5 Write short notes:**a) Net Present Value versus Internal Rate of Return**

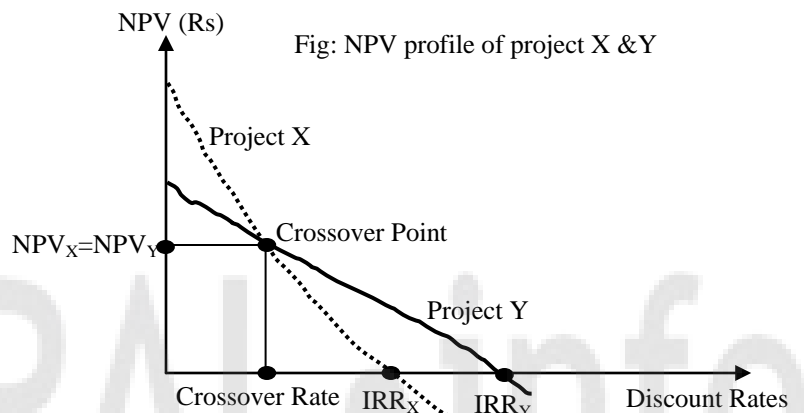
- IRR and NPV methods give same accept-reject decisions.

- IRR and NPV methods may rank projects differently if the projects are of different costs, timing of cash flows differ, or have unequal lives.
- NPV gives clear-cut accept-reject decision rule, while the IRR may give multiple results.
- The NPV of different projects are additive while the IRRs cannot be added.
- NPV gives better ranking as compared to the IRR.
- If two projects are independent, then the NPV and IRR criteria always lead to the same accept/reject decision.
- When the IRR and NPV methods give conflicting results, the NPV method should be relied upon since it gives the incremental addition to the value of the firm.

b) NPV profiles & Crossover rate

The NPV profile is a graph that illustrates a project's NPV against various discount rates, with the NPV on the y-axis and the cost of capital on the x-axis. To begin, we simply calculate a project's NPV using different cost-of-capital assumptions. Once these are calculated, we plot the values on the graph.

The crossover rate is the discount rate at which the NPVs of two projects are same. The NPV profile shows NPV graph of project X and project Y is crossover at crossover point.



The crossover rate is the discount rate at which the NPVs of two projects are same. The NPV profile shows NPV graph of project X and project Y is crossover at crossover point.

c) Discounted payback period

Discounted payback method is the combination of payback period and the discounted cash flow technique. In this technique, the cash flows of the project are discounted to find their present values. The present value of the cash inflows is then compared with the present value of cash outflows in order to identify the period taken to recover the initial cost or the present value of outflow. The discounted payback period is also calculated in the same way as the payback period, except that the future cash inflows are first discounted then the payback is calculated.

d) Profitability Index (PI)

Profitability index may be defined as the ratio of the present value of the future cash flows to the initial outlay. Profitability index is also known as benefit cost ratio or present value index. In symbol,

$$PI = \frac{\text{Total present value}}{\text{Net cash outlay}}$$

e) Modified Internal Rate of Return (MIRR)

MIRR assumes that cash flows from all projects are reinvested at the cost of capital as opposed to the project's own IRR. This makes the modified internal rate of return a better indicator of a project's true profitability. The rate of return which equates the initial investment with a

projects terminal value, where the terminal value is the future value of the cash inflows compounded at the required rate of return (the opportunity cost of capital).

Decision rule

For independent projects, if the MMR is greater than the required rate of return, the project should be accepted, if MMR is less than the required rate of return, it should be rejected. If two projects are mutually exclusive, the one with the higher MIRR should be chosen.

