INVESTMENT DECISIONS

- Long-term investments represent sizeable outlays of funds that commit a firm to some course of action.

- Consequently, the firm needs procedures to analyze and properly select those investments.

- Capital budgeting is the process of evaluating and selecting long-term investments consistent with the firm's goals of shareholder wealth maximization

Importance of Capital Budgeting

- A firm's capital budgeting decision defines its strategic direction because development of new products or services and penetration into new markets must be preceded by capital expenditures.
- Effective capital budgeting improves both the timing and quality of asset additions.

- An erroneous forecast of asset requirements can have serious consequences
- If the firm invests too much, it will incur unnecessarily heavy expenses.
- If it does not spend enough, its equipment will not be sufficiently modern to enable it produce competitively and it may lose a portion of its market share to rival firms

- Capital budgeting is also important because asset expansion typical involves substantial expenditures, and before a firm spends a large amount of money, it must make proper financing plans

Independent Vs Mutually exclusive projects

- Independent projects are those whose cash flows are unrelated or independent of one another; the acceptance of one does not eliminate the others from further consideration

- Mutually exclusive projects are those that have the same function and therefore compete with one another. The acceptance of one eliminates from further consideration all other similar-function projects

Accept-Reject Vs Ranking Decisions

- The accept-reject approach involves evaluating capital expenditure projects to determine whether they meet the firm's minimum acceptance criterion

- Ranking approach involves evaluating projects on the basis of some predetermined measure, such as the rate of return. The project with the highest return is ranked first, and the project with the lowest return is ranked last

Unlimited Funds Vs Capital Rationing

- If a firm has unlimited funds for investments, all independent projects that provide returns greater than some predetermined level can be accepted.

- Capital rationing means that firms have limited resources available for capital expenditures and numerous projects compete for these resources. Therefore, the firm must ration its funds by allocating them to projects that maximize share value.

Expansion Vs Replacement Decisions

- The most common motive for a capital expenditure is to expand the level of operations usually through acquisition of fixed assets.

- A growing firm often needs to acquire new assets rapidly, such as the purchase of property and plant facilities.

- As a firm's growth slows and it reaches maturity, most capital expenditures will be made to replace obsolete or worn out assets.

Capital Budgeting Methods

Pay-back Period Method

- The payback period is the expected number of years required to recover the original cost of the investment.

- If the payback period is less than the maximum acceptable payback period, the project is accepted

- If the payback period is greater than the maximum acceptable payback period, the project is rejected.

- The length of the maximum acceptable payback period is determined by management and is simply a value that management feels on average will result in good, value-creating investment decisions.

Example

Assume the following cash flows for two projects

Year	Expected after-tax Net cash flows	
	Project A	**Project B**
0	Sh (10,000)	Sh (10,000)
1	5,000	1,000
2	4,000	3,000
3	3,000	4,000
4	1,000	6,000

REQUIRED: Pay-back periods for the two projects

Disadvantages of the Pay-back period

- The appropriate payback period is merely a subjectively determined number.

- It fails to take into account the time factor in the value of money i.e. the cash flows are not discounted.

- It fails to recognize the cash flows that occur after the payback period.

Rationale for the Pay-back period method

- It provides information on how long funds will be tied up in a project.
- Thus, the shorter the payback period, the greater is the project's liquidity.
- Since cash flows expected in the distant future are generally riskier than the near-term cash flows, the payback period is often used as one indicator of a project's riskiness.
- The payback period is popular because of its computational simplicity.
- Many firms thus use it as a decision criterion or as a supplement to sophisticated decision techniques.

Discounted pay-back period method

- The discounted payback period is defined as the number of years required to recover the cost of the investment from discounted net cash flows.

EXAMPLE

Calculate the discounted payback period for the two projects in the above example assuming a discount rate of 10%.

Net Present Value (NPV) Method

- The NPV is obtained by subtracting a project's initial investment outlay from the PV of its cash flows, discounted at a rate equal to the firm's cost of capital.

  NPV = PV of cash inflows – Initial investment outlay.

- When NPV is used to make accept-reject decisions, the decision criteria are as follows:

  If the NPV > 0, accept the project
  If the NPV < 0, reject the project

EXAMPLE

Calculate the NPV of the two projects, A and B at a cost of capital of 10%.

Profitability Index

- The PI shows the relative profitability of any project.
- A project is acceptable if its PI is greater than 1, and the higher the PI, the higher the project's ranking

$$PI = \frac{PV\ of\ cash\ inflows}{PV\ of\ costs}$$

EXAMPLE

Calculate the PI for the two projects A and B based on a cost of capital of 10%

INTERNAL RATE OF RETURN

- The IRR is the discount rate that equates the PV of cash inflows with the initial investment associated with a project.

- It is the discount rate that equates the NPV of an investment opportunity with zero.

- When IRR is used to make accept-reject decisions, the decision criteria are as follows:-
- If the IRR is greater than the cost of capital, accept the project
- If the IRR is less than the cost of capital, reject the project

EXAMPLE

- Calculate the IRR of the two projects, A and B.

Comparison of NPV and IRR methods

- If two projects are independent, then the NPV and IRR criteria always lead to the same accept/reject decision.

- However, for mutually exclusive projects, there are cases where ranking projects on the basis of NPV and IRR methods may give contradictory results.

- The conflicts in ranking will be due to one or a combination of the following.

- Scale of investment i.e. differences in costs of the projects.

- Cash flow pattern i.e. differences in timing of cash flows.

- Project life i.e. differences in useful lives of projects.

Scale Differences

Suppose a firm has two mutually exclusive projects that are expected to generate the following cash flows

Year	Net Cash Flows	
	Project S	**Project L**
0	Sh (10,000)	Sh (100,000)
1	7,000	60,000
2	7,000	60,000

REQUIRED: Calculate the NPV, PI and IRR of each project assuming a required rate of return of 10%

- Project S is preferred if we use the either IRR or PI while project L is preferred if we use the NPV method.
- Since the results of the IRR are expressed as a percentage, the scale of the investment is ignored.
- Likewise, because the PI looks at the relative profitability, the scale of the investment is also ignored.
- In contrast, the results of the NPV method are expressed in absolute terms and project L is clearly superior.

Differences in Cash flow patterns

Assume that a firm is facing two mutually exclusive projects with the following cash flow patterns:

| Year | Net Cash Flows | |
	Project S	Project L
0	Sh (120,000)	Sh (120,000)
1	100,000	10,000
2	50,000	60,000
3	10,000	108,000

REQUIRED: Compute the NPV, IRR and PI of each project, assuming a required rate of return of 10%.

- This conflict is due to different implicit assumptions with respect to the re-investment rate on intermediate cash flows released from the projects.
- The IRR implicitly assumes that funds can be re-invested at the IRR over the remaining life of the project.
- The NPV and PI measures, however, implicitly assume reinvestment at a rate equivalent to the required rate of return used as the discount rate.

- With the IRR, then, the implicit re-investment rate will differ from project to project depending on the pattern of the cash flow stream for each project under consideration.
- With the NPV, however, the implicit reinvestment rate, i.e. the required rate of return, is the same for each project.

- This reinvestment rate represents the minimum return on opportunities available to the firm.

- Thus, when mutually exclusive projects rank differently because of cash flow pattern differences, the NPV rankings should be used.

- This helps to identify the project that adds most to shareholder wealth.

Differences in project's lives

- When projects have unequal useful lives and different rankings, the NPV method should be adopted

MULTIPLE IRRs

- This is a situation in which a project has two or more IRRs.

- Such a project is said to have an unconventional cash flow pattern.

- A project has a conventional cash flow pattern if it has cash outflows in one or more periods at the beginning of its life, followed by a series of cash inflows

- If, however, a project has a large cash outflow either sometimes during or at the end of its life, then it has an unconventional cash flow pattern.

- In such a case, the cash flow stream changes sign more than once. This is likely to lead to more than one IRR i.e. multiple IRRs.

With all these problems, why is the IRR method used at all?

- The reason is that many managers find the IRR easier to visualize and interpret than they do the NPV measure.

- One does not have to initially specify a required rate of return in the calculations.

- To the extent that the required rate of return is but a rough estimate, the IRR method may permit a more satisfying comparison of projects for the typical manager.

- Managers feel comfortable with a return measure as opposed to an absolute NPV figure.

- As long as the company is not confronted with many mutually exclusive projects or with unusual projects having multiple sign changes in the cash flow stream, the IRR method may be used with reasonable confidence

MODIFIED INTERNAL RATE OF RETURN

- In spite of a strong academic preference for NPV, managers find IRR intuitively more appealing to analyze investments in terms of percentage rates of return than absolute amounts of NPV.

- The IRR can be modified and made a better indicator of relative profitability, and hence better for use in capital budgeting.

The MIRR is defined as follows:

PV of costs = PV of terminal value

$$\text{PV of costs} = \frac{TV}{(1 + MIRR)^n}$$

- The left term is simply the PV of the investment outlays when discounted at the cost of capital

- The numerator of the right term is the future value of the inflows, assuming that the cash inflows are reinvested at the cost of capital.

- The compounded term in the numerator is also called the Terminal value or TV.

- The discount rate that forces the PV of the TV to equal the PV of the costs is defined as the MRR

EXAMPLE

Calculate the MIRR for the two projects A and B.

- The MIRR has a significant advantage over the regular IRR.
- MIRR assumes that cash flows from all projects are reinvested at the cost of capital, while the regular IRR assumes the cash flows are reinvested at the project's own IRR.
- Since, reinvestment at k is generally a better assumption, the MIRR is a better indicator of a project's true profitability.
- MIRR also solves the multiple IRR problem.

Is MIRR as good as NPV for selecting among mutually exclusive projects?

- If the two projects are of equal size and have the same life, then the NPV and MIRR will always lead to the same project selection decision.

- If the projects are of equal size, but differ in lives, the MIRR will always lead to the same decision as the NPV if the MIRRs are both calculated on the basis of the longer project's life. (Just fill in zeros for the shorter project's missing cash flows)

- However, if the projects differ in scale (size) then conflicts can still occur- if we were comparing a large project with a small mutually exclusive one, we might find NPV of A>NPV of B but MIRR of A < MIRR of B.

- The MIRR is superior to the regular IRR as an indicator of a project's "true" rate of return or expected "long term rate of return", but the NPV method is still better for choosing among mutually exclusive projects because it always provides a good indicator of how much each project contributes to the value of the firm.

CAPITAL RATIONING

- Capital rationing is a situation where a constraint (or budget ceiling) is placed on the total amount of capital expenditures during a particular period.
- Such constraints are prevalent in a number of firms, particularly in those that have a policy of internally financing all capital expenditures.
- Another example of capital rationing occurs when a division of a large company is allowed to make capital expenditures only upto a specified budget ceiling over which the division usually has no control.

- With a capital rationing constraint, the firm attempts to select the combination of projects that will provide the greatest increase in the value of the firm subject to not exceeding the budget ceiling constraint.
- When capital is rationed over multiple periods, several alternative methods of handling constrained maximization can be applied to the capital rationing problem. These methods make use of linear, integer or goal programming.

ILLUSTRATION

Assume that your firm faces the following investment opportunities

Project	Initial cash Outflow	NPV	IRR	PI
A	Sh 50,000	Sh 12,000	15%	1.24
B	35,000	15,000	19	1.43
C	30,000	42,000	28	2.40
D	25,000	1,000	26	1.04
E	15,000	10,000	20	1.67
F	10,000	11,000	37	2.10
G	10,000	13,000	25	2.30
H	1,000	100	18	1.10

REQUIRED

If the budget ceiling for initial cash outflows during the present period is Sh 65,000 and the projects are independent of one another, select the combination of projects that provides the greatest increase in firm value that Sh 65,000 (or less) can provide.

- A budget ceiling carries a real cost when it prevents one from taking advantage of any additional profitable opportunities.

- In the above example a number of opportunities are foregone by the imposition of the sh65,000 budget ceiling.

- Thus capital rationing usually results in an investment policy that is less than optimal

- From a theoretical stand point, a firm should accept all projects yielding more than the required rate of return.

- By doing so, it will increase the market price per share of its common stock because it is taking on profits that will provide a return higher than necessary maintain the present market price per share

- Hence, if a firm rations capital and rejects projects that yield more than the required return, the firm's investment policy is less than optimal.

- Management could increase the value of the firm to the shareholders by accepting those rejected value-creating projects.