CAPITAL INVESTMENT DECISION

3

Capital Investment is the most important of all the major financial decisions of an enterprise namely investment decision, financing decision and dividend decision. It covers the main aspects of management of capital expenditure such as planning for capital requirements to be invested as fixed capital; determination of long term financial policies, planning for capital & financial structures and control of capital expenditure. Investment decision is the core of financial management. This is because of the fact that of all the major aspects of financial management viz. management of capital expenditure, investment decision, working capital management, profit management, tax management, merger and combination etc.; Capital investment decision is the most vital one. The success or failure of an enterprise depends to a great extent on its correct capital investment decision. Therefore, **UNIT#THREE** includes the following lessons as regards capital investment decision:

1. Capital Investment : Its Principles (Lesson : 1)

2. Project Cash Flow (Lesson : 2)

3. Capital Budgeting Techniques (Lesson : 3)

4. Risks and Uncertainties in Capital Investment (Lesson : 4)

5. Cost of Capital (Lesson : 5)

6. Value Creation through Required Market Returns (RMR) (Lesson:6)

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Lesson–1: Capital Investment: Its Principles

After successful completion of the lesson 1, you should be able:

* To realize the concept and significance of capital investment decision,

* To understand the various types of capital investment and

* To get acquainted with the administrative aspects of capital investment.

Concept and Significance of Capital Investment Decision

Concept of Capital Investment Decision

The investment decisions of a firm are generally known as the capital budgeting, or capital expenditure decisions. A capital budgeting decision may be defined as the firm's decision to invest its current funds most efficiently in the long-term assets in anticipation of an expected flow of benefits over a series of year. The long – term assets are those which affect the firm's operations beyond the one year period. The firm's investment decisions would generally include expansion, acquisition, modernization and replacement (BMRE) of the long-term assets. Sale of a division or business (disinvestment) is also analyzed as an investment decision. Activities such as change in the methods of sales distribution, or undertaking an advertisement campaign or research and development programme have long – term implications for the firm's expenditures and benefits, and therefore, they may also be evaluated as investment decisions.

> *A capital budgeting decision may be defined as the firm's decision to invest its current funds most efficiently in the long-term assets in anticipation of an expected flow of benefits over a series of year*

The following are the features of investment decisions:
* The exchange of current funds for future benefits.
* The funds are invested in long-term assets.
* The future benefits will occur to the firm over a series of years.

It is significant to emphasize that expenditures and benefits of an investment should be measured in cash.

Significance of Capital Investment

Investment decisions require special attention because of the following reasons:
* They influence the firm's growth in the long run.
* They affect the risk of the firm.
* They involve commitment of large amount of funds.
* They are irreversible, or reversible at substantial loss.
* They are among the most difficult decisions to make.

Growth: The effects of investment decisions extend into future and have to be endured for a longer period than the consequences of the current operating expenditure. A firm's decision to invest in long-term assets has a decisive influence on the rate and direction of its growth. A wrong decision can prove disastrous for the continued survival of the firm; unwanted or unprofitable expansion of assets will result in heavy operating costs to the firm. On the other hand, inadequate investment in assets would make it difficult for the firm to compete successfully and maintain its market share.

Risk : A long-term commitment of funds may also change the risk complexity of the firm. If the adoption of an investment increases average gain but causes frequent fluctuations in its earnings, the firm will become more risky. Thus, investment decisions shape the basic character of a firm.

Funding: Investment decisions generally involve large amount of funds, which make imperative for the firm to plan its investment programs very carefully and make an advance arrangement for procuring finances internally or externally.

Irreversibility : Most investment decisions are irreversible. It is difficult to find a market for such capital items once they have been acquired. The firm will incur heavy losses if such assets are scrapped.

Complexity: Investment decisions are among the firm's most difficult decisions. It is really a complex problem to correctly estimate the future cash flow of an investment. The uncertainty in cash flow is caused by economic, political, social and technological forces.

Types of Capital Investment

There are many ways to classify investments. One classification is as follows:

- Expansion of existing business
- Expansion of new business
- Replacement and modernization of old business,

Expansion of a new business requires investment in new products and a new kind of production activity within the firm.

Expansion and Diversification: 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. Expansion of a new business requires investment in new products and a new kind of production activity within the firm. If a package manufacturing company invests in a new plant and machinery to produce ball bearings, which the firm has not manufactured before, this represents expansion of new business or diversification. Sometimes a company acquires existing firm to expand its business. In, either case, the firm makes investment in the expectation of additional revenue. Investments in existing or new products may also be called as *revenue – expansion investments*.

Replacement and Modernization: The main objective of modernization and replacement is to improve operating efficiency and reduce costs. Cost savings will reflect in the increased profits, but the firm's revenue may remain unchanged. Assets become outdated and obsolete with technological changes. The firm must decide to replace those assets with new assets that operate more economically. If a cement company changes from semi – automatic drying equipment to fully automatic drying equipment, it is an example of modernization and replacement. Replacement decisions helps to introduce more efficient and economical assets and therefore, are also called cost – reduction investments. However, replacement decisions which involve substantial modernization and technological improvements expand revenue as well as reduce costs.

Yet another useful way to classify investments is as follows:

- Mutually Exclusive Investments
- Independent Investment
- Contingent Investment.

Mutually Exclusive Investments: Mutually exclusive investments serve the same purpose and compete with each other. If one investment is undertaken, others will have to be excluded. A company may, for example, either use a more labor – intensive, semi – automatic machine, or employ a more capital intensive, highly automatic machine for production. Choosing the semi – automatic machine precludes the acceptance of the highly automatic machine.

Independent investments : Independent investments serve different purpose and do not compete with each other. For example, heavy engineering company may be considering expansion of its plant capacity to manufacture additional excavators and addition of new production facilities to manufacture a new product – light commercial vehicles. Depending on their profitability and availability of funds, the company can undertake both investments.

Contingent investments : Contingent investments are dependent projects; the choice of one investment necessitates undertaking one or more other investments. For example, if a company decides to build a factory in a remote, backward area; it may have to invest in houses, roads, hospitals, schools etc. for employees to attract the work force. Thus, building of factory also requires investment in facilities for employees. The total expenditure will be treated as one single investment.

Administrative Aspects of Capital Investment Decision

The successful administration of capital investment decision of a firm involves the following aspects:
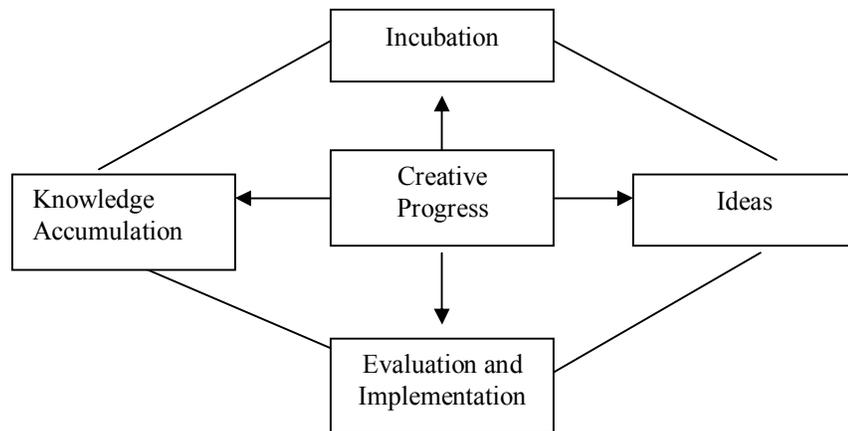
i.   Generation of ideas of proposals,
ii.   Formulation of investment projects,
iii. Principles and processes of investment decision,
iv.   Elements of capital investment analysis,

The following sub – sections examine each of the aspects:

Generation of Proposal Ideas

The first and foremost important administrative aspect of capital investment decision is the generation of proposal ideas. For generating ideas, the firms have to engage the competent persons like researchers, engineers, planners, incubators, financial analysts and others who in a scientific way constantly look for workable ideas. Such a model of findings ideas may be seen below:

The Creativity Thinking Progress

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                         ┌─────────────┐
                         │  Incubation │
                         └─────────────┘
                         ↑
  ┌────────────────┐   ┌──────────────┐   ┌──────────┐
  │   Knowledge    │ ← │   Creative   │ → │   Ideas  │
  │  Accumulation  │   │   Progress   │   │          │
  └────────────────┘   └──────────────┘   └──────────┘
                         ↓
                     ┌──────────────────┐
                     │   Evaluation and │
                     │   Implementation │
                     └──────────────────┘
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Processing of Ideas

A number of alternative ideas are initially identified for further scrutiny, evaluation and testing.

A number of alternative ideas are initially identified for further scrutiny, evaluation and testing. Various aspects of these initially selected ideas are weighted in terms feasibility, cost – benefits, technicalities, environmental impacts etc to finally arrive at one acceptable idea. This may be gauged as under:

1. **Preliminary evaluation and testing of ideas:** Once business ideas are discovered, screening and testing of these ideas are done. The following considerations are significant in the evaluation and testing of business ides.

 a) **Technical feasibility**: It refers to the possibility of producing the product. Technical feasibility of an idea is judged in terms of availability

of necessary technology, machinery and equipment, labor skills and raw materials.

b) Commercial viability: A cost benefit analysis is required to ascertain the profitability of the ideas. An elaborate study of market conditions and prevailing situation is made to assess the viability and prospects of the proposed project.

2. Detailed Analysis: After preliminary evaluation of the idea, the promising idea is subjected to a through analysis from all angles.

Selection of Ideas

Generally, the pre-feasibility evaluation report along with the following considerations, influence the selection of the idea for a product or service:

a)   Products whose imports are banned or restricted by the Government.
b)   Products based on the expansion or diversification plans .
c)   Products which ensured specific advantages. The advantage might accrue because of the scale of the industry or the location of the factory or technology of manufacture.
d)   Products favored by the country's industrial/licensing policy e.g. delicensed industries.
e)   Products for which incentives and subsidies are available.
f)   Products which can be exported usually and profitably.
g)   Products creating ready demand.
h)   Products in which the entrepreneurs have production or marketing experience.
   i) Products having parent ancillary relationship .
   j) Products showing higher profitability.

Project Formulation

By project formulation we mean the preparation of a project. It is by itself an analytic management aid. It enables the entrepreneur to arrive at the most effective project decision. Project formulation normally includes the following aspects:

By project formulation we mean the preparation of a project

i.   Feasibility Analysis,
ii.   Technical analysis,
iii.   Economic analysis,
iv.   Financial analysis,
v.   Cost – benefit analysis,
vi.   Input analysis,
vii.   Project appraisal and
viii. Project designed and net work analysis.
i.   Feasibility Analysis : It includes – i) pre – project feasibility study and project feasibility study The later is made from the angles of technical, managerial, organizational, commercial, financial, and economic situations.
ii.   Technical Analysis: It deals with the technical aspects of the project.

iii. **Economic Analysis:** It deals with project demand potential.

iv. **Financial Analysis:** It deals with financial characteristics of a project. It is made to see whether a project is financially viable or not.

v. **Cost – benefit Analysis**: Under this analysis, estimates of social costs and social benefits are made. This analysis examines whether a project is viable from social profitability.

vi. **Input Analysis:** It is primarily concerned with the identification, quantification and evaluation of project inputs.

vii. **Project Appraisal**: This refers to the evaluation of projects in order to accept or reject the project.

viii. **Project designed and net work Analysis:** This includes the designing and scheduling of the project's specific work.

Principles and Processes of Investment Decision

The following are the major principles of investment decision, which must be \followed by the firms while formulating investment proposals:

i. **Determination of the need of investment:** The following matters are relevant while determining the necessity of investment:

a) Types of investment project – new project, BMRE of existing projects, research and development and others.

b) Future expected return from the project,

c) Recommendation of the relevant high officials,

d) Condition of other similar project,

e) Investment costs and their major elements like pre–construction, construction, plant, machinery, equipment, furniture etc.

    ii. Authorities involved in formulation, evaluation, selection and approval of projects.

    iii. Time horizon of the project - project lifetime.

Investment analysis must be from the angles of the project economic analysis and financial analysis.

The entire process of an investment decision is divided into the following main groups:

a) Formulation of projects after conducting detailed feasibility study.

b) Project evaluation and selection from the viewpoints of –

- Economical viability,
- Commercial viability,
- Technical viability and
- Marketing viability.

c) Project approval – approval of the appropriate authority is essential.

d) Investment of project through –

- Requisite financing of the project
- Formulation of Project Implementation Committee consisting of the persons like engineers and technicians, architects, managers, financial analysts and economists, suppliers and other.

- Procurement of plant, machinery, equipments and furniture.
- Development of infrastructure facilities.
- Construction of factory and residential buildings
- Procurement of raw materials and other supplies.
- Appointment requisite manpower – skilled and unskilled.
- Any other relevant activities.

Elements of Capital Investment Analysis

Proper analysis of investment decision is the vital aspect. Such analysis must be from the angles of the project economic analysis and financial analysis. The following are the important elements involved in investment analysis which need careful consideration of the economic and financial analysts:

i.   Amount of the total capital, both fixed and working to be invested in projects. Both over investment and underinvestment in projects are harmful.
ii.   Selection of appropriate sources of financing the project.
iii. Estimation of future cash inflows from the project.
iv.   Determination of project lifetime.
v.   Scrap value of the project.
vi.   Selection of method and rate of depreciation of the plant, machinery etc.
vii. Discounting of cash flows.

Review Questions

Short Questions:

1. Define capital investment decision.
2. What is project formulation? What are the various projects' aspects?
3. How do you process the generation of project ideas?
4. How do you select a project idea?

Broad Questions:

5. Discuss the nature, characteristics and significance of capital investment decisions,
6. What are the various types of capital investment decision? Explain each of them.
7. Discuss the various stages of project formulation,
8. Explain the major principles and processes of capital investment decision.
9. What are the main elements involved in investment analysis? Explain each of them.

Lesson–2: Project Cash Flow

After successful completion of the lesson 2, you should be able :

- To have an idea about the concept of cash flow and understand the difference between cash flow and profit

- To understand the components of cash flow

- To know how cash flow is are determined and

- To understand the interaction between financing and investment decisions

Concept of Cash Flow

Cash flow refers to the actual cash, as opposed to accounting net income that a firm receives or pays during certain specified period. What the firm receives is known as cash inflows, but what the firm pays is known as cash outflow. The difference between cash inflows and cash outflows are considered as net cash flows.

Relevant cash flows are the specific cash flows that should be considered in a capital investment decision. There are some cash flows known as irrelevant for a specific investment. However, the following Table – 1 shows the relevant and irrelevant cash flows:

Table – 1

Relevant and Irrelevant Cash Flow

Relevant Cash Flows	Irrelevant Cash Flows
i. Variable labor expenses	i. Fixed overhead costs
ii. Variable material costs	ii. Sunk costs
iii. Cost of the investment	
iv. Marginal taxes	

Incremental cash flows refer to the change in a firm's net cash flows attributable to an investment project. These cash flows result directly from the decision to accept or reject the project.

Differences between Concepts of Cash Flow and Profit

Theoretically, two alternative criteria are available to quantify the benefits: (i) accounting profit and (ii) cash flows. The basic difference between them is primarily due to the inclusion of certain non cash expenses in the profit and loss account, for instance, depreciation. Therefore, the accounting profit is to be adjusted for non-cash expenditure to determine the actual cash inflow. The cash flow approach of measuring future benefits of a project is superior to the accounting

approach as cash flows are theoretically better measures of the net economic benefits of costs associated with a proposed project.

The firm must pay for the purchase of an asset with cash. This cash outlay represents a forgone opportunity to use cash in some other productive alternatives. Consequently the firm should measure the future net benefits in cash terms. Only cash flows reflect the actual cash transactions associated with the project. Secondly, the use of cash flows avoids accounting ambiguities. Thirdly, the cash flow approach takes cognizance of the time value of the money whereas the accounting approach ignores it.

Components of Cash Flow

A typical investment will have three components of cash flow

- Initial investment

- Annual net cash flow

- Terminal cash flow

Initial Investment

Initial investment is the net cash outlay in the period in which an asset is acquired.

Initial investment is the net cash outlay in the period in which an asset is acquired. A major element of the initial investment is original value of the asset which comprises of its costs and installation charges. When an asset is acquired for expanding revenues it may require a lump sum investment in working capital. Thus, initial investment will equal to gross investment plus increase in net working capital.

Annual Net Cash Flow

An investment is expected to generate annual cash flows from operations after the initial cash outlay has been made. Cash flows should always be estimated on an after tax basis. The net cash flows (NCF) are simply the difference between cash receipts and cash payment including taxes. NCF will mostly consist of annual cash flows occurring from the operation of an investment. But it may also be affected by changes in net working capital and capital expenditure during the life time of the investment. NCF will be found out as follows:

NCF = Revenues – Expenses – Taxes.

Terminal Cash Flow

The terminal cash flows include the salvage value and the tax impact of the disposition of the project

Terminal Cash flows are the net cash flows that occur at the end of the life of a project, including the cash flows associated with : (i) the final disposal of the project and (ii) returning the firm's operations to where they were before the project was accepted. Consequently, the terminal cash flows include the salvage value and the tax impact of the disposition of the project. Any working capital accounts changes that occurred at the beginning of the project's life will be reversed at the end of its life.

Determination of Cash Flow

Determination of cash flow involves three main steps: namely i) estimating cash flow, ii) determining incremental cash flow and iii) determining relevant cash flow.

i) **Estimating Cash Flow**: For capital budgeting cash flows have to be estimated. There are certain elements of cash flow stream namely tax effect, effect on other project, effect of indirect expenses, effect of working capital and effect of depreciation.

ii) **Determining Incremental Cash Flow**: Incremental cash flows are those that results directly from the decision to accept the project. These cash flows, called incremental cash flows, represent the changes in a firm's total cash flows that occur as a direct result of accepting the project. To determine if a specific cash flow is considered incremental it is necessary to find out whether it is affected by the purchase of the project. Cash flows that will change because the project is purchased are incremental cash flows. While calculating incremental cash flows sunk costs, opportunity costs, externalities etc. need to be considered.

iii) **Determining Relevant Cash Flow**: In case of single proposal, relevant cash flows will be : i) cost of new project, ii) + installation costs, iii) +- working capital requirement. However, the following format shows the determination of cash inflows:

	Years				
	1	2	3	------	N
Cash sales revenues					
Less Cash Operating cost					
Cash inflow before taxes (CFBT)					
Less Depreciation					
Taxable income					
Less Tax					
Earning after taxes					
Plus Depreciation					
Cash inflow after taxes (CFAT)					
Plus salvage value (in nth year)					
Plus Recovery of working capital (in nth year)					

Investment and Financing Decisions: Interrelationship

Investment and financing decisions are the two vital financial decisions of a corporate firm. After taking investment decision, the question of financing decision arises in order to finance the investments. A firm in practice may plan to finance an investment under consideration either by equity capital, preferred capital and debt capital or by combination of any two or all. Now the question is: should the proceeds of debt, equity, and preferred and payments of interest, dividends and principal be considered in the computation of investment's net cash flows? According to the conventional approach where WACC is used as discount arte, the answer is no. The net cash flows of an investment do not incorporate interest charges and their tax shield. So,

$$\Delta NCF = \Delta EBIT (I - T) + \Delta DEP - \Delta NWC - \Delta CAPEX$$

The logic for the above formula lies in the definition of the opportunity costs of capital (discount rate) used for discounting investment's net cash flows. Creditors and shareholders respectively provide debt and equity capital to finance investment. In return, creditors get fixed interest and shareholders get dividend. When, we discount an investment's net cash flows by the WACC of debt and equity, we are in fact ensuring that the investment yields enough cash flows to make payments of interests and repayment of principal to creditors and dividends to shareholders. Any cash flows remain is an addition to the wealth of the shareholders.

Problems and Solutions

Problem – 1

The marketing department of a firm estimates that 3,000units of a product can be sold annually at a unit sale price (cash) of Tk. 14 each. The cash variable expenses to manufacture and sell the product will be Tk. 9 per unit. It will also involve cash fixed cost of Tk. 5,000 yearly.

The machine to manufacture the product is available in the market and will cost Tk. 50,000. It expected useful life is 10 years. The installation cost would amount to Tk. 10,000. As a result of the acquisition of the machine, the working capital requirement will increase by Tk. 40,000.

The firm uses the straight line depreciation to depreciate its fixed assets. It is in the 50% tax bracket. The machine qualifies for 25% investment allowance.

You are required to compute the relevant cash flows (outflows and inflows) associated with the acquisition of the machine, assuming:

a)   there is no salvage value,

b)   the salvage value is Tk. 2,000 when for depreciation purpose,

    i.   it is ignored

    ii.   it is considered.

Solution:

Cash outflow at beginning (t= 0)

1. Cost of new machine	Tk. 50,000
2. Add installation cost	10,000
3. Add additional working capital requirement	40,000
4. Less tax savings due to investment allowance	
(Tk. 50,000 x 25%) x 50% -	6,250
	Tk. 93,750

Cash inflow (t = 1 – 10)

a) Cash inflows during the life of Project (t = 1 – n)

Year	Sales Revenue (Tk.)	Cash Operating Cost (Tk.)	Depreciation (Tk.)	Taxable income (2 – 3+ 4) (tk.)	Taxes @ 50% (tk.)	Earnings after taxes (Tk.)	CFAT (7+4) (Tk.)
1	2	3	4	5	6	7	8
1-9	42,000	32,000	6,000[1]	4,000	2,000	2,000	8,000
10	42,000	32,000	6,000	4,000	2,000	2,000	8,000
Working capital recovery							40,000
							48,000
b) i) (Salvage value, but ignored for depreciation purposes)							
1-9	42,000	32,000	6,000	4,000	2,000	2,000	8,000
10	42,000	32,000	6,000	4,000	2,000	2,000	8,000
Working capital recovery							40,000
Salvage value Tk. 2,000							
Less tax 1,000							1,000
							49,000
b) ii) Salvage value considered							
1-9	42,000	32,000	5,800[2]	4,000	2,100	2,100	7,900
10	42,000	32,000	5,800[2]	4,000	2,100	2,100	7,900
Working capital recovery							40,000
Salvage value (no tax adjustment)							2,000
							49,900

Notes: 1. (Tk. 50,000+Tk. 10,000)/10years = Tk. 6,000.

2. (Tk. 50,000 + Tk. 10,000 – Tk. 2,000)/10 years = Tk. 5,800.

Problem – 2

Phonex Ltd. has under its consideration two mutually exclusive proposal. The following information are related to them.

Particulars	Proposal **X**	Proposal **Y**
Net cash outlay	Tk. 1,00,000	Tk. 75,000
Net cash savings in operating expenses before depreciation taxes :		
Year		
1		
2	25,000	18,000
3	30,000	20,000
4	35,000	22,000
5	25,000	20,000
	20,000	16,000

Required :

Determine the incremental cash flows assuming straight-line depreciation, no salvage value, and 50% tax.

Solution:

Incremental Cash Flow: Mutually Exclusive Situation

A. Incremental/Differential cash outflow at t = 0

Cost of proposal X	Tk. 1,00,000
Less cost of proposal Y	- 75,000
Incremental Cash Outflow	25,000

B. Incremental cash inflow after taxes (t = 1 – 5)

Particulars	Years				
	1 (Tk.)	2 (Tk.)	3 (Tk.)	4 (Tk.)	5 (Tk.)
Savings in cash operating cost before taxes (CFBT)					
Proposal X	25,000	30,000	35,000	25,000	20,000
Proposal Y	18,000	20,000	22,000	20,000	16,000
Net excess cash savings in proposal X	7,000	10,000	13,000	5,000	4,000
Less Tax on excess cash savings	3,500	5,000	6,500	2,500	2,000
a) After tax savings in cash operating expenses	3,500	5,000	6,500	2,500	2,000
Depreciation:					
Proposal X	20,000	20,000	20,000	20,000	20,000
Proposal Y	15,000	15,000	15,000	15,000	15,000
Excess depreciation	5,000	5,000	5,000	5,000	5,000
b) Tax savings on excess depreciation	2,500	2,500	2,500	2,500	2,500
Incremental CFAT (a+b)	6,000	7,500	9,000	5,000	4,500

Review Questions:

Short Questions

1. What are the components of cash flows? Explain each of them.

2. How would you estimate cash flows? Explain the major ingredients involved in such estimate.

3. How would you interact between investment and financing decisions? Explain.

Broad Questions

4. Give the concepts of the following terms:

. a) Cash Flows; b) Relevant Cash Flows; c) Incremental Cash Flows and d) Terminal Cash Flows.

5. Distinguish between cash flows and accounting profits. Which one should be used in capital investment decision? Why?

6. Write short notes on the flowing:

a) Net Cash Flows; b) Sunk Costs; c) Opportunity Costs and d) Externalities.

7. How are relevant cash flows determined in cases of (i) Single proposal; (ii) Replacement situation and (iii) Mutually exclusive situation?

Review Problems:

Problem – 1

A plant's base price is Tk. 1,40,000 and it cost another 30,000 to modify it for special use. It would be sold after 3 years for Tk. 60,000. Use of the plants would require an increase in net working capital of Tk. 8,000. The plant would have no effects on revenue, but it is expected to save Tk. 50,000 per year in before tax operating costs. The firm's marginal tax rate is 40%.

a) What is the initial investment outlay of the plant?
b) What are the incremental operating cash flows in years 1, 2, and 3?
c) What is the terminal cash flows in year 3?

Problem – 2

The XYZ company is evaluating the proposed acquisition of a new milling machine. The machine's base price is Tk. 1,08,000 and it would cost another Tk. 12,500 to install this same. The machine's life will be three years and it would be sold after three years for Tk. 65,000. The machine would require an increase in net working capital of Tk. 5,500. The machine would have no effect on revenues but it is expected to save

Tk. 40,000 per year in before tax operating costs. The company's marginal tax rate is 35%.

a)   What is the investment outlay of the machine?
b)   What are the incremental operating cash flows in years 1, 2, and 3?
c)   What is the terminal cash flows in year 3?
d)   If the project's arte of return is 12%, should the machine be purchased?

Case Study

Read the following case carefully and answer the questions follow:

Case Study on

"United Chemical Company"

Margaret Simpson's first day as financial analyst at United Chemical Company began with a summons to the office of Clive Knowland, the assistant controller.

"Margaret," Clive began even before she had a chance to sit, "the Consumer Products Division gave me this proposal last week," he said holding up a sheaf of papers.

"It's a new product called the Personal Security System. It's a miniature siren that can be heard for several blocks, something like those anti-theft devices for cars. Top management has a lot of interest in this.

"According to the summary," Clive continued, "the rate of return exceeds the 22 percent hurdle rate for new products."

"Sounds interesting," Margaret volunteered.

"Yes," Clive conceded, "but I notice that Oscar Jones prepared the proposal, and he's notorious for leaving important things out.

"And that worries me, because if people get an incorrect proposal, things can get mighty uncomfortable around here. Would you look it over carefully? Don't hesitate to call Oscar, but as a rule he doesn't give much help."

Margaret went back to her desk, and it didn't take her long to note two items of concern.

1.   There didn't seem to be any adjustment for inflation in the figures.

2.   No adjustments were made to cash flows for working capital.

She placed a call to Oscar.

"Oscar," she started, "I have a couple of questions about the proposal."

"Go ahead," Oscar replied impatiently.

"Well, do the sales and expense figures have any inflation in them?"

"Yes and no," responded Oscar. "We didn't inflate the numbers, if that's what you're getting at; but inflation won't be a problem because we plan to pass on any cost increases through higher prices. Our profit margin will stay the same."

"But do you have a feel for what kind of inflation you might experience in, say, raw materials or labor expenses?" persisted Margaret.

"Well, your guess is as good as mine, but if it will make you happy," Oscar said wearily, "the paper this morning said inflation's down to 7 percent. Anything else I can help you with?"

"Yes," said Margaret, "one more thing. Did you include the working capital requirements in the cash flow projections?"

"We didn't forget them," Oscar replied sharply. "See, in the 'working capital' section, in the black and white."

"Yes, of course," Margaret answered. "I just wanted to make sure they're not included in the $5 million equipment category. Thanks for your help, Oscar."

Margaret studied the cash flow projections and the working capital requirements (Table – 1) and new that she should make some changes and discuss them with Knowland.

Table – 1

Cash Flow Projections ($000)

Gross Investment	$5,000				
Less: Tax credit	500				
Net Investment	$4,500				
Year	1	2	3	4	5
Sales	$5,000	$10,500	$12,500	$11,750	$7,000
Cash expenses	3,500	8,350	9,750	9,000	5,000
Depreciation	750	1,100	1,050	1,050	1,050
Profit before taxes	$ 750	$ 1,050	$ 1,700	$ 1,700	$ 950
Taxes (46% rate)	345	483	782	782	437
Net income	$ 405	$ 567	$ 918	$ 918	$ 513
Depreciation	750	1,100	1,050	1,050	1,050
Cash flow	$1,155	$ 1,667	$ 1,968	$ 1,968	$ 1,563
Working capital	$ 500	$ 2,100	$ 2,500	$ 2,300	$ 0

Questions:

a)   Prepare the revised Cash Flow Projections after necessary adjustments for inflation and working capital and

b)   Comment on the revised Cash Flow Projections of United Chemical Company.

Lesson–3: Capital Budgeting Techniques

After successful completion of the lesson 3, you should be able –

- To realize the concept & significance of Capital budgeting

- To learn the techniques of capital budgeting in order to evaluate an investment project

- To evaluate the various techniques of capital budgeting in order to make comparison among themselves,

- To learn computation of the Payback Period, Discounted Payback , Accounting Rate of Return, Net Present Value, Internal Rate of Return, Net Terminal Value and Profitability Index of the projects with a view to accept/ reject them,

- To know the concept of capital rationing and project selection under the same,

Concept & significance of Capital budgeting

Capital budgeting is a long term planning for commitment of funds to fixed assets. It involves the whole process of capital expenditure planning which includes: (i) planning of capital exp. (ii) evaluation of capital investment projects & (iii) Control of capital expenditures
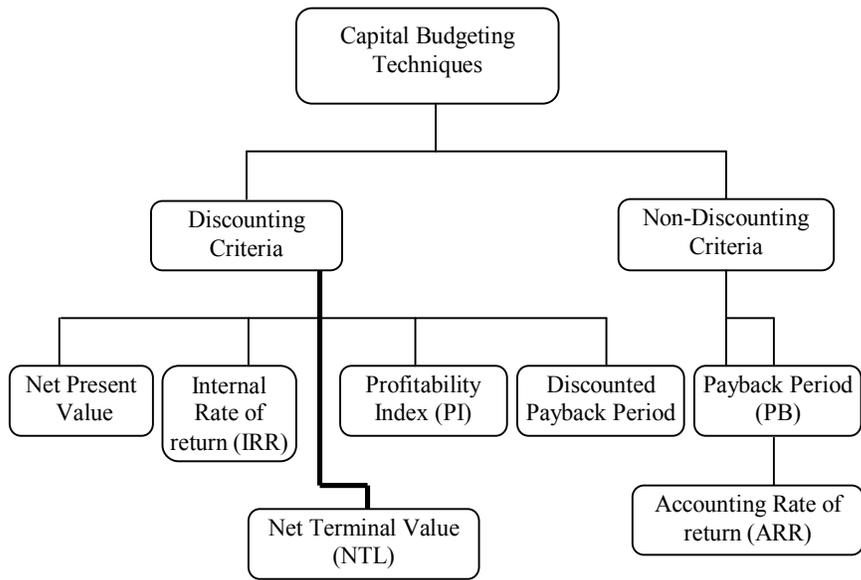
Significance:

Capital budgeting is significant because:

(i)   Such decision has long-term effect & affects the firm's cost structure by committing a sizeable amount of fixed assets.
(ii)   It entails a huge amount of fixed capital, which is limited & subject to rationing.
(iii)   It is not easy to make since it requires technical know how.
(iv)   Fixed Assets' acquision & expansion are related to future sales, which is always uncertain.
(v)   It involves greater risk & uncertainty.
(vi)   Such decision once taken & implemented can not easily be changed without considerable financial loss to the firm.

Techniques of Capital Budgeting

Techniques, also known as methods of capital budgeting can be classified into two main categories namely: i) Traditional / Non - discounted techniques and ii) Sophisticated/ Discounted Cash flow techniques. This may be presented in the following figure.

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                    ┌─────────────────────┐
                    │  Capital Budgeting  │
                    │     Techniques      │
                    └─────────────────────┘
                              │
              ┌───────────────┴───────────────┐
      ┌───────────────┐              ┌───────────────────┐
      │  Discounting  │              │  Non-Discounting  │
      │   Criteria    │              │     Criteria      │
      └───────────────┘              └───────────────────┘
```

Net Present Value Technique

The net present value (NPV) method is the classical economic method of evaluating the investment proposals. It is one of the discounted cash flow (DCF) techniques explicitly, recognizing the time value of money. It correctly postulates that cash flows arising at different time periods differ in value and are comparable only when their equivalents—present values—are found out. The following steps are involved in the calculation of NPV:

It is one of the discounted cash flow (DCF) techniques explicitly, recognizing the time value of money.

- Cash flows of the investment project should be forecasted based on realistic assumptions;

- Appropriate discount rate should be identified to discount the forecasted cash flows. The appropriate discount rate is the firm's opportunity cost of capital which is equal to the required rate of return expected by investors on investments of equivalent risk;

- Present value of cash flows should be calculated using opportunity cost of capital as the discount rate;

- Net present value should be found out by subtracting present value of cash outflows from present value of cash inflows. The project should be accepted if NPV is positive (i.e. NPV > 0).

The formula of the NPV can be written as follows:

$$NPV = \left[\frac{C_1}{(1+k)} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} + \ldots\ldots\ldots + \frac{C_n}{(1+k)^n} \right] - C_0$$

$$\text{or} \quad = \sum_{t=1}^{n} \frac{C_t}{(1+k)^t} - C_0$$

where C_1, C_2, …. represent net cash inflows in year 1, 2, …., k is the opportunity cost of capital, C_0 is the investment and n is the expected life of the investment. It should be noted that the cost of capital, k is assumed to be known and is constant.

Acceptance rule:

It should be clear that the acceptance rule using the NPV method is to accept the investment project if its net present value is positive (NPV > 0) and to reject it if the net present value is negative (NPV < 0). Positive NPVs contribute to the net wealth of the shareholders, which should result in the increased price of a firm's share. The positive net present value will result only if the project generates cash inflows at a rate higher than the opportunity cost of capital. A project may be accepted if NPV =0. A zero NPV implies that project generates cash flows at a rate just equal to the opportunity cost of capital. Thus, the NPV acceptance rules are **:**

- Accept if NPV > 0

- Reject if NPV < 0

- May accept if NPV = 0

Internal Rate of Return Technique

The internal rate of return (IRR) of a project is the discount rate which makes its NPV equal to zero.

The internal rate of return (IRR) method is another discounted cash flow technique which takes account of the magnitude and timing of cash flows. This technique is also known as yield on an investment, marginal efficiency of capital, marginal productivity of capital, rate of return, time-adjusted internal rate of return, rate of return over cost. The concept of IRR is quite simple to understand in the case of a one period project.

The internal rate of return (IRR) of a project is the discount rate which makes its NPV equal to zero. That is, it is the discount rate which equates the present value of future cash flows with the initial investment. It is the value of r in the following equation:

$$C_o = \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \text{..............} + \frac{C_n}{(1+r)^n}$$

$$C_0 = \sum_{t=1}^{n} \frac{C_t}{(1+r)^t}$$

$$= \sum_{t=1}^{n} \frac{C_t}{(1+r)^t} - C_0 = 0$$

where, C_t = cash flow at the end of year t,

r = internal rate of return (IRR),

n = life of the project.

Acceptance Rule:

The accept or reject rule, using the IRR method, is to accept the project if its IRR is higher than the opportunity cost of capital. The IRR acceptance rules are as follows:

- Accept if r > k

- Reject if r< k

- May accept if r = k

Net Terminal Value Technique

The terminal value approach even more distinctly separates the timing of the cash inflows and cash outflows. The assumption behind the method is that each cash inflow is reinvested in another asset at a certain rate of return from the moment it is received until the termination of the project.

The terminal value approach even more distinctly separates the timing of the cash inflows and cash outflows.

Acceptance Rule:

If the present values of the sum total of the compounded reinvested cash inflows (PVTS) is greater than the present value of the outflows (PVO) the project accepted, otherwise not. Symbolically –

PVTS > PVO, accept

PVTS < PVO, reject.

Profitability Index Technique

Profitability index (PI) also known as Benefit Costs Ratio measures the present value of returns (cash inflows) per taka invested. It is a relative measure which is obtained by dividing the present value of future cash inflows by the present of cash out flows. Symbolically –

It is a relative measure which is obtained by dividing the present value of future cash inflows by the present of cash out flows.

PI = PV of cash inflows/PV of cash out flows

This is knows as benefit cost ratio because the numerator measures the benefit and denominator measures costs.

Acceptance Rule:

A project will qualify for acceptance if its PI exceeds 1, the rules are as follows:

Accept if PI > 1,

Reject if PI < 1, and

May accept if PI = 1

The DPP rule is as follows: An investment is acceptable if its DPP < some pre-specified number of years.

Discounted Payback Period

The discounted payback period (DPP) is the length of time until the sum of the discounted cash flows becomes equal to the initial investment. The

DPP rule is as follows: An investment is acceptable if its DPP < some pre-specified number of years. DPP will be always higher than the PBP since the former the considers discounted cash flows ; while the later considers conventional cash inflows. If DPP lies within the project's life the project will produce positive NPV.

Accounting Rate of Return Technique

Accounting rate of return (ARR) refers to average rate of return on investment.

Accounting rate of return (ARR) refers to average rate of return on investment. So, ARR is found out by dividing return on investment by its investment and multiplying the result by 100.

Acceptance Rule:

- Accept if ARR > minimum rate

- Reject if ARR< minimum rate

Pay Back Period

Pay back period (PBP) refers to the number of years required to recover the initial outlay of the investment by the returns derive from the investment.

Pay back period (PBP) refers to the number of years required to recover the initial outlay of the investment by the returns derive from the investment. Symbolically PBP = Initial investment / Annual return (cash inflow).

Acceptance Rule:

- Accept if PBP > standard payback

- Reject if PBP< standard payback

Evaluation of Capital Budgeting Techniques

Evaluation of NPV Technique

Major Merits of NPV
i)   It explicitly recognizes and considers the time value of money,
ii)   It considers the total benefits derived from the project during its entire life,
iii) It is reasonable and reliable,
iv)   Changes in NPV can be found out only by changing the rate of discount,
v)   It is particularly useful in case of mutually exclusive projects,
vi)   It is always consistent with the objective of maximization of shareholders wealth.

Major Demerits of NPV
i)   It is difficult to calculate and understand,
ii)   The calculation of required rate of return to discount the cash flows involves serious problem,
iii) It is an absolute measure, hence it fails to make comparison among projects of different outlays,
iv)   It is not dependable in case of projects having different life periods

Conclusion:

It is widely used by the large firm since it recognizes the time value of money and total benefits of the project.

Evaluation of IRR Techniques

Major Merits of IRR

i)   It exclusively considers the time value of money,

ii)   It considers the total cash inflows and outflows of the projects,

iii)   It provides itself a rate of return which is an indicative of the profitability of the project.

iv)   It is easy to understand.

Major Demerits of IRR

i)   It involves tedious mathematical calculations,
ii)   It makes no difference as to the quality of cash receipts from the projects,
iii)   It if not feasible in practice that under IRR all intermediate cash flows are reinvested at the IRR.

Conclusion:

Because of the complex mathematical calculation, IRR is not so much widely use by the large firms.

Evaluation of NTV Techniques

It is assumed that in NTV each cash inflow is reinvested in another asset at a certain rate of return. But this assumption is not feasible.

Evaluation of PI Technique

Major Merits of PI

i)   It recognizes the time value of money,
ii)   It considers the total cash inflows during the life of the projects,
iii)   In a situation of capital rationing it is a better evaluation technique.
iv)   It is reasonable and reliable.

Major Demerits of PI

i)   It is difficult to calculate and understand,
ii)   It involves much difficulty in discounting cash inflows,
iii)   It is an absolute measure, hence fails to make comparison,
iv)   It is difficult to estimate future economic conditions, and hence, problem arises in finding out present value of the future cash income.

Conclusion

Because of tough calculations involved in PI, this technique is not popularly used by the corporate firms.

Evaluation of DPP

Major Merits DPP
i.   It considers time value of money,
ii.   It is easy to understand,
iii.   It does not accept negative estimated NPV investment,
iv.   It is biased towards liquidity,

Major Demerits of DPP

i.   May reject positive NPV investments,

ii.   Requires and arbitrary cut off point,

iii.   Ignores cash flows beyond the cut off date,

iv.   Biased against long – term projects.

Conclusion:

This technique is widely used by the small corporate firms since it considers time value of money.

Evaluation of ARR

Major Merits of ARR

i)   Its computation is easy since all the data required are available,

ii)   It is easy to understand and follow,

iii)   There is no chance of omitting most profitable projects, since it considers the entire life of the project.

Major Demerits of ARR

i.   It does not consider cash flows ,

ii.   It fails to apply the time value of money,

iii.   It does not consider at all the risk element involved in the project.

Conclusion:

Because of its simplicity, this technique is used by the small and medium firms with greater reliability.

Evaluation of PBP

Major Merits of PBP

i)   Its computation is easy since all the data required are available,

ii)   It is easy to understand and follow,

iii)   It considers the entire life period of the project,

iv)   It highlights on the liquidity aspects of the projects,

Major Demerits of PBP

i.   It ignores the cash inflows of the project,

ii.   It fails to consider the time value of money,

iii.   It does not consider net profits,

iv.   It does not consider the scrap value of the project.

Conclusion:

Because of its simplicity this method is followed by the small and medium firms confidently.

Comparisons Among Main Techniques of Capital Budgeting

Comparison between NPV and IRR

We have shown that the NPV and IRR methods yield the same accept-or-reject rule in case of independent conventional investments. However, in real business situations there are alternative ways of achieving an objective and, thus, accepting one alternative will mean excluding the other. As defined earlier, investment projects are said to be mutually exclusive when only one investment could be accepted and others would have to be excluded. For example, in order to distribute its products a company may decide either to establish its own sales organization or engage outside distributors. The more profitable out of the two alternatives shall be selected. This type of exclusiveness may be referred to as technical exclusiveness. On the other hand, two independent projects may also be mutually exclusive if a financial constraint is imposed. If limited funds are available to accept either Project A or Project B, this would be an example of financial exclusiveness or capital rationing The NPV and IRR methods can give conflicting ranking to mutually exclusive projects. In the case of independent projects ranking is not important since all profitable projects will be accepted. Ranking of projects, however, becomes crucial in the case of mutually exclusive projects. Since the NPV and IRR rules can give conflicting ranking to projects, one cannot remain indifferent as to the choice of the rule.

The NPV and IRR methods can give conflicting ranking to mutually exclusive projects

In case of conflicting results given by NPV and IRR for two mutually exclusive projects; the project whose NPV is higher needs to be accepted.

The NPV and the IRR rules will give conflicting ranking to the projects under the following conditions:

• The cash flow pattern of the projects may differ. That is, the cash flows of one project may increase over time, while those of others may decrease or vice –versa.
• The cash outlays (initial investments) of the projects may differ.
• The projects may have different expected lives.

Conclusion:

In case of conflicting results given by NPV and IRR for two mutually exclusive projects; the project whose NPV is higher needs to be accepted. For instance, the following are the results of mutually exclusive projects of A and B :

	NPV	IRR
Project A	Tk. 12,000	12%
Project B	Tk. 9000	15%

Both the projects are good. But project A is better since it has higher NPV. The IRR technique indicates that Project B should be accepted since it has a higher IRR. In cases of such conflicting results, one should give weightage to NPV. Since, the technique is fully consistent with the objective of maximization of wealth of the share holders. Therefore, in this case project A should be accepted since its NPV is higher than that of project B.

Therefore, it can be concluded that in case of the mutually exclusive projects, the wisest and easiest way is to compare the NPV of the projects; and choose one which generates higher NPV.

Comparison between NPV and PI

The NPV technique gives a better mutually exclusive choice than PI.

In most situations, the NPV and PI provide the same accept/reject decision, because both the methods are closely related to each other. It may be recalled here that under the PI method the project will be accepted if PI is greater than 1. In that case a project has a positive NPV. On the other hand, if PI of the project is less than 1 it would have negative NPV. However, while evaluating mutually exclusive projects this technique may give rankings. As for example, the following results relate to the Projects X and Y:

Projects	NPV (Taka)	PI (In Time)
X	19,000	1.39
Y	17,000	1.49

Thus, project X is acceptable under the NPV technique while the project Y acceptable under the PI technique. Now, which project should be accepted? Since the NPV technique is superior to any other techniques; hence project X should accepted. Therefore, we can conclude that the NPV technique gives a better mutually exclusive choice than PI. The NPV method grantees the choice of the best alternatives.

Capital Rationing

Concept of Capital Rationing& Its Application

Capital rationing refers to the situation in which the firm has more acceptable investments, requiring a greater amount of finance than is available with the firm.

Capital rationing is central in the planning and control of capital expenditures, since requests for funds normally exceed supply. Capital rationing refers to the situation in which the firm has more acceptable investments, requiring a greater amount of finance than is available with the firm. It is concerned with the selection of a group of investment proposals out of many investment proposals acceptable under the accept – reject decision. Ranking of the investment projects is employed in capital rationing. Projects can be ranked on the basis of some pre –

determine criterion such as the rate of return. The projects are ranked in the descending order of the rate of return

Project Selection Under Capital Rationing

The objective to select the combination of projects would be the maximization of total NPV. The projects selection under capital rationing involves two stages : i) Identification of the acceptable projects, and ii) Selection of the combination of the projects. The acceptability of the projects can be based either on profitability or IRR.

Problems and Solution:

Problem – 1

The following information relate to the projects A and B :

Particulars	Project A (Tk.)	Project B (Tk.)
Initial Investment	10 lac	14 lac
Residual Value	.50 lac	2.00 lac
Effective Life	5 Years	5 Years
Depreciation Method	Straight line	Straight line
Tax Rate	50%	50%
Expected Rate of Return	10%	10%
Income before depreciation and tax:		
1st Year	2.5 lac	4.00 lac
2nd Year	2.5 lac	4.00 lac
3rd Year	2.00 lac	3.50 lac
4th Year	2.00 lac	3.25 lac
5th Year	1.80 lac	3.00 lac

Of the projects A and B, which one would be more profitable and why? Apply NPV technique.

Solution:

Calculation of Net Cash Benefit (CFAT):

Project A

Year	CFBT (Tk.)	Dep. (Tk.)	EBT (Tk.)	Tax (50%)	NI (Tk.)	CFAT (Tk.)
1	2,50,000	1,90,000	60,000	30,000	30,000	2,20,000
2	2,50,000	1,90,000	60,000	30,000	30,000	2,20,000
3	2,00,000	1,90,000	10,000	5,000	5,000	1,95,000
4	2,00,000	1,90,000	10,000	5,000	5,000	1,95,000
5	1,80,000	1,90,000	(10,000)	--	(10,000)	1,80,000
5	50,000		50,000	--	50,000	50,000

$$\text{Depreciation} = \frac{\text{Investmental-Residual Value}}{\text{Project Life}} = \frac{10,00,000 - 50,000}{5} = 1,90,000$$

Table showing calculation of NPV of CFAT (NCB):

Year	NCB	PV factor at 10%	NPV
0	(10,00,000)	1.00	(10,00,000)
1	2,20,000	0.9091	2,00,000
2	2,20,000	0.8265	1,81,819
3	1,95,000	0.7513	1,46,505
4	1,95,000	0.6830	1,33,187
5	1,80,000	0.6209	1,11,766
5	50,000	0.6209	<u>31,046</u>
NPV			Tk. (1,95,677)

Project B

Year	CFBT (Tk.)	Dep. (Tk.)	EBT (Tk.)	Tax (50%)	NI (Tk.)	CFAT (Tk.)
1	4,00,000	2,40,000	1,60,000	80,000	80,000	3,20,000
2	4,00,000	2,40,000	1,60,000	80,000	80,000	3,20,000
3	3,30,000	2,40,000	1,10,000	55,000	55,000	2,95,000
4	3,25,000	2,40,000	85,000	42,500	42,500	2,82,500
5	3,00,000	2,40,000	60,000	30,000	30,000	2,70,000
5	2,00,000	--	2,00,000	--	2,00,000	2,00,000

$$\text{Depreciation} = \frac{\text{Investmental-Residual Value}}{\text{Project Life}} = \frac{14,00,000 - 2,00,000}{5} = 2,40,000$$

Table showing calculation of NPV:

Year	NCB	PV factor at 10%	NPV
0	(14,00,000)	1.00	(14,00,000)
1	3,20,000	0.9091	2,90,909
2	3,20,000	0.8265	2,64,464
3	2,95,000	0.7513	2,21,636
4	2,82,500	0.6830	1,92,950
5	2,70,000	0.6209	1,67,648
5	2,00,000	0.6209	<u>1,24,184</u>
NPV			Tk. (1,38,209)

Comment : None of the project is acceptable, because both the projects have negative NPV.

Problem – 2

A company is considering an investment proposal to install new milling controls. The project will cost Tk. 50,000. The facility has a life expectancy of 5 years and no salvage value. The company's tax rate is 55% and no investment allowance is allowed. The firm uses straight line depreciation. The estimated cash flows before tax (CBT) from the proposed investment proposal are as follows:

Year	CFBT (Tk.)
1	10,000
2	11,000
3	14,000
4	15,000
5	25,000

Compute the following:
i)   Payback period,
ii) Average rate of return,
iii) Internal rate of return,
iv) Net present value at 10% discount rate,
v)   Discounted payback period
vi) Profitability index at 10% discount rate,

Comment on the results computed as above.

Solution

Table showing calculation of cash flow after tax (CFAT):

Year	CFBT	Dep.	NP	Tax	NPAT	CFAT
1	10,000	10,000	--	--	--	10,000
2	11,000	10,000	1,000	550	450	10,450
3	14,000	10,000	4,000	2200	1800	11,800
4	15,000	10,000	5,000	2750	2250	12,250
5	25,000	10,000	15,000	8250	6750	16,750

$$\text{Depreciation} = \frac{\text{Cost of Machine-Salvage Value}}{\text{Life of Machine}} = \frac{50,000 - 0}{5} = 10,000$$

i)   Pay back period

Table showing calculation of payback period

Year	CFAT	Cumulative CFAT
1	10,000	10,000
2	10,450	20,450
3	11,800	32,250
4	12,250	44,500
5	16,750	61,250

$$\text{PBP} = \text{No. of Year before} + \frac{\text{Unrecovered cost at start of full recovery year}}{\text{Total CF during full recovery year}}$$
$$\text{Full recovery of OI}$$

$$= 4 + \frac{5,500}{61,250} = 4.09 \text{ years}$$

Since the PBP equal to 4.09 years is closer to projects last year which is 5 years; hence, PBP of the project appears to be too high signifying that project would require much time to recover its original investment by the net cash flows.

ii)   Average rate of return (ARR)

$$\text{ARR} = \frac{\text{Average Income (NPAT)}}{\text{Average Investment}} \times 100 = \frac{11250/5}{50,000/2} \times 100 = 9\%$$

Comment **:** Since ARR of the project is less than the rate of opportunity cost i.e., rate of discount equal to 10%; hence the project will not be profitable. Its return would not cover its cost of capital.

(iii) IRR

We are required to determine the value of r in the following equation as IRR is that rate of discount which equals PV of CFAT equal to PV of CO.

$$CO = \sum_{i=1}^{t} \frac{CF_t}{(1+r)^t} \quad = \quad 50,000 = \frac{61,250}{(1+r)^5}$$

Now, you have to find out the discount factor (F) which is close to (50,000/12,250) = 4.082. We should look to present value annuity table which is close to this factor against 5 years. This factor lies between 6% and 7% . Therefore, IRR also lies between 6% and 7%.

Table showing calculations of NPV at 6% and 7%

		PV Factor		NPV	
Year	CFAT	6%	7%	6%	7%
0	(50,000)	--	--	(50,000)	(50,000)
1	10,000	.943	.935	9430	9350
2	10,450	.890	.873	9300	9123
3	11,800	.840	.816	9912	9629
4	12,250	.792	.769	9702	9347
5	16,750	.747	.173	12512	11942
				856	(609)

The IRR is between 6% and 7%. The NPV is + Tk. 856 at 6% and the NPV is – Tk. 609 at 7%. Thus a 1% difference in the discount rate causes a difference in the present values of Tk. (Tk. 50,856 – Tk. 49,391). Therefore, Tk. 609 would require adjustment for 0.41 (Tk. 609 + Tk. 1,465).

Subtracting 0.41 from 7%, we get 6.59% as the IRR.

Comment **:** IRR of the project comes to only 6.59% which is much below the opportunity cost of capital equal to 10%; the project is not profitable. Since IRR does not cover cost of capital.

Net Present Value (NPV)

Table showing the calculations of NPV

Year	CFAT	PV factor at 10%	NPV	Cumulative DCF
0	(50,000)	--	(50000)	--
1	10,000	.909	9090	9090
2	10,450	.826	8632	17722
3	11,800	.751	8862	26584
4	12,250	.683	8367	34951
5	16,750	.621	10401	45352
			(4,648)	

Comment : Since NPV of the project is negative equal to Tk. 4,648, so the project should be rejected.

iii)   Discounted PBP

We know that, discounted PBP is that year where discounted cash flow equals to original investment. We have seen in the above table that discounted cash flow at the end of 5^{th} year (project life) is only 45,352 which is far behind original investment of Tk. 50,000. Hence, discounted PBP is beyond 5 years.

Comment : Since discounted PBP is beyond project's life, indicating negative NPV; the project is not acceptable.

iv)   Profitability Index

$$PI = \frac{PV \text{ of cash inflows (CFAT)}}{PV \text{ of cash outflows (CO)}}$$

$$PI = \frac{Tk.\ 45,352}{Tk.\ 50,000} = 0.907.$$

Comment **:** Since PI equal to .907 is less than 1 signifying negative NPV; hence the project is not acceptable.

Review Questions:

Short Questions:

1. Define Capital Budgeting. Discuss its significance.

2. Explain the accept/ reject rule in cases of **:**
   a) Pay Back Period Technique and b) Average Rate Return Technique

3. Under what circumstances do the NPV and IRR techniques differ? Which technique would you prefer and why ?

4. Explain the conditions when conflicting ranking would be given by IRR and NPV to the mutually exclusive projects?

5. What is a PI ? Of the PI and NPV which technique is superior and why?

6. If a project with conventional cash flows has a pay back period less than the project's life, can you definitively state that algebraic signs of the NPV ? Why or why not ?

7. If you know that the discounted pay back period is less than the project's life, what can you say about NPV ? Explain.

Broad Questions:

8. What are the traditional techniques of capital budgeting? Explain their characteristics.

9. How would you compute the following techniques?
   a) Pay Back Period and b) Average Rate of Return? Explain.

10. How would you evaluate the traditional techniques of capital budgeting? Explain.

11. What are the Discounted Cash Flow Techniques of Capital Budgeting? Explain.

12. How would you compute the following techniques:
    a) Discounted payback period; b) Net present value; c) Internal rate of return d) Profitability index and e) Net terminal value ? Explain.

13. Explain accept/reject rules in cases of **:**
    (i) NPV, (ii) IRR, (iii) PI and (iv) NTV.

14. How would you evaluate the discounted cash flow techniques of capital budgeting ? Discuss.

15. Compare and contrast the following techniques **:**
    (a) NPV and IRR, (b) NPV and PI.

Review Problems

Problem – 1

A company is considering an investment proposal to install a new machine at a cost of Tk. 1,00,000. Its life period is 5 years with a residual value of Tk. 15,000. The tax rate is 40 percent. The estimated cash flows before depreciation and tax are as follows :

Year	CFBT (Taka)
1	26,000
2	28,650
3	30,200
4	35,100
5	55,600

Required Rate of Return is estimated at 12%

Compute the following :

(i) Pay Back Period, (ii) Average Rate of Return, (iii) Internal Rate of Return, (iv) Net Present Value, (v) Discounted Pay Back Period and (vi) Profitability Index.

Problem - 2

The projects' expected cash flows before depreciation and taxes are as follows :

Year	Expected Cash Flows	
	Project A	Project B
0	(1,45,000)	(1,50,000)
1	(15,000)	45,000
2	42,500	55,000
3	75,000	72,000
4	82,000	78,000
5	96,000	95,000

Which of the projects A and B should be accepted and why ? Apply NPV and IRR techniques.

The required rate of return for Project A is estimated at 10% and for Project B 12%.

Case Study

The Pran Fruit Farm has always hired transient workers to pick its annual Cherry crop. Mr. Ali, the Far Manager has received information on a Cherry picking machine that is being purchased by many fruit farms. The machine is a motorized-device that shakes the Cherry tree causing the Cherries to fall into plastic tarps that funnel the Cherries into bins. Ms. Ali has gathered the following information to decide whether a Cherry picker would be a profitable investment for the Pran Fruit Farm.

(a)   At present, the farm is paying an average of Tk. 40,000 per year to the transient workers to pick the Cherries.

(b)   The Cherry-picker would cost Tk. 94,500 having an estimated 12 year useful life. The farm uses strait line depreciation method. The estimated salvage value of the Cherry-picker Tk. 4,500.

(c)   Annual out-out-of-pocket costs associated with the Cherry-picker would be the cost of an operator and an assistant Tk. 14,000, insurance Tk. 200, fuel Tk. 1,800 and maintenance cost Tk. 3,000.

Questions:

(i)   Determine the Annual savings in cash operating costs that would be realized if the Cherry-picker were purchased.

(ii)   Compute the simple rate of return expected from the Cherry-picker. Would the Cherry-picker be purchased if the farm requires a 16% return ?

(iii)   Compute the pay back period of the Cherry-picker. The farm will not purchase it unless it has a pay back period of 5 years or less. Would the Cherry-picker be purchased ?

(iv)   Compute the IRR promised by the Cherry-picker.

Lesson–4: Risks and Uncertainties in Capital Investment

After successful completion of the lesson 4, you should be able–

- To grasp the concept of risk and uncertainty, drawing clear differences between them;

- To know the techniques of measuring the risks involved in capital investment decision and

- To understand the approaches/ methods of evaluating risk involved in capital budgeting decision framework.

Concepts of Risks and Uncertainties and their Distinctions

Risk refers to the set of unique outcomes for a given event which can be assigned probabilities while uncertainty refers to the outcomes of a given event which are too unsure to be assigned probabilities.

The term risk with reference to investment decisions may, therefore, be defined as the variability in the actual returns emanating from a project in future over its working life in relation to the estimated return as forecasted at the time of the initial, capital budgeting decision.

The decision situations with reference to risk analysis in capital budgeting decisions can be broken up into three types : (i) uncertainty, (ii) risk, and (iii) certainty. The risk situation is one in which the probabilities of a particular event occurring are known. These probabilities are not known under the uncertainty situation. The difference between risk and uncertainty, therefore, lies in the fact that the variability is less in risk than in the uncertainty. In other words, in a strict mathematical sense, there is a distinction between the two :

"Risk refers to the set of unique outcomes for a given event which can be assigned probabilities while uncertainty refers to the outcomes of a given event which are too unsure to be assigned probabilities".

That is, risk exists when the decision-maker is in a position to assign probabilities to various outcomes (i.e. a probability distribution is known to him). This happens when the decision-maker has some historical data on the basis of which he assigns probabilities to other projects of the same type. Uncertainty exists when the decision-maker has no historical data from which to develop a probability distribution and must make intelligent guesses in order to develop a subjective probability distribution. For example, if the proposed project is completely new to the firm, the decision-maker, through research and consultation with others, may be able to subjectively assign probabilities to various outcomes. Throughout this lesson, however, the terms risk and uncertainty will be used interchangeably to refer to an uncertain decision-making situation.

In brief, risk with reference to capital budgeting, results from the variation between the estimated and the actual returns. The greater the variability between the two, the more risky the project.

From the above discussions, the following elements of risks as well as uncertainties can be derived:

Major Elements of Risks:

i. Risk can be measured upto to a specific level;
ii. The decision makers are aware of the probabilities of estimated income;
iii. The events are generally subject to repetition and
vi. Variability in actual income is less.

Major Elements of Uncertainties:

i. Variability in actual income is more,

ii. Uncertainty is not measurable.

iii. Fails to provide sufficient information on alternative course of actions.

Techniques of Measuring Risks

The techniques of measuring risks are as follows:

(i) Sensitivity Analysis; (ii) Standard Deviation and (iii) Co-efficient of variation. The following sub–sections deal with each of the techniques.

Sensitivity Analysis

One measure which expresses risk in more precise terms is sensitivity analysis. It provides information as to how sensitive the estimated project parameters, namely, the expected cash flow, the discount rate and the project life are to estimation errors. The analysis on these lines is important as the future is always uncertain and there will always be estimation errors. Sensitivity analysis takes care of estimation errors by using a number of possible outcomes in evaluating a project. The method adopted under the sensitivity analysis is to evaluate a project using a number of estimated cash flows to provide to the decision-maker an insight into the variability of the outcomes. Let us illustrate the use of sensitivity analysis for estimated cash flows.

Sensitivity analysis takes care of estimation errors by using a number of possible outcomes in evaluating a project.

The sensitivity analysis provides different cash flow estimates under three assumptions: (i) the worst (i.e. the most pessimistic), (ii) the expected (i.e. the most likely), and (iii) the best (i.e. the most optimistic) outcomes associated with the project.

The quantification of variability of returns involves two steps. First, depending on the chance of occurrence of a particular cash flows estimate, probabilities are assigned. The assignment of probabilities can be *objective or subjective*. Objective probability refers to the assignment of a probability, which is based on a large number of observations, under independent and identical situations, on the basis of the experience of happening or not happening of the event. However, objective probability is not of much use in capital budgeting situations because they do not satisfy the requirement of independent observations repeated over time.

They are rather based on single event. Probability assignments which are not based objective evidence of a large number of trials of identical events are called subjective or personal probability assignments. The assignment of probabilities to cash flow estimates is subjective.

The second step is to estimate the expected return on the project. The returns are expressed in terms of expected monetary values. The expected value of a project is a weighted average return, where the weights are the probabilities assigned to the various expected events, i.e. the expected monetary values of the estimated cash flows multiplied by the probabilities.

Standard Deviation

Standard deviation is a measure that indicates the degree of uncertainty (or dispersion) of a cash flow and is one measure of risk.

Standard deviation is a statistical technique and it is an absolute measure of risks which can be applied when the projects involve the same outlay. lf the projects to be compared involve different outlays, the coefficient of variation is the correct choice, being a relative measure. In statistical terms, standard deviation is defined as the square root of the mean of the squared deviations, where deviation is the difference between, an outcome and the expected mean value of all outcomes. Further, to calculate the value of standard deviation by its probability of occurrence.

Algebraically,

$$\sigma = \sqrt{\sum P(CF - \overline{C}F)^2}$$

Where, P = probability,

CF = Cash Flows,

$\overline{C}F$ = Mean of CF

The greater the standard deviation of a probability distribution, the greater is the dispersion of outcomes around the expected value. Standard deviation is a measure that indicates the degree of uncertainty (or dispersion) of a cash flow and is one measure of risk. If the two projects have the same expected value (mean), then one which has the greater σ will be said to have the higher degree of uncertainty or risk.

Co–efficient of Variation

This is another statistical technique of risk measurement and it is relative measure. The standard deviation can be misleading in comparing the uncertainty of the alternative projects, if they differ in size. In such cases co – efficient of variation (CV) is a correct measure which can be calculated as follows:

The co-efficient of variation adjusts for the size of the cash flow, whereas the standard deviation does not.

$$CV = \frac{\text{Standard Deviation}}{\text{Expected Cash Flow}} \quad \text{or} \quad \frac{\sigma}{CF}$$

The co–efficient of variation is a better measure of risk involved in cash flow return then the standard deviation. This is because, the co-efficient

of variation adjusts for the size of the cash flow, whereas the standard deviation does not.

Approaches of Risk Evaluation

There are four approaches of risk evaluation namely ; i) Risk adjusted discount rate (RADR) , ii) Certainty equivalent (CE), iii) Probability distribution (PD) and iv) Decision tree (DT) .

i. **RADR Approach :** Under this approach, the amount of risk inherent in a project is incorporated in the discount rate employed in PV calculations. Relatively, risky projects would have higher discount rates; and relatively safer or less risky projects would have lower discount rates. The following equation is used for determining NPV under RADR approach :

$$NPV = \sum \frac{CFAT}{(1+K_r)^t} - CO$$

Under RADR approach, the amount of risk inherent in a project is incorporated in the discount rate employed in PV calculations.

Where, CFAT = Expected cash flow after tax in year t

Kr = Risk adjusted discount rate

CO = Cash outflows

t = No. of year

ii. **CE Approach** Under this approach, the riskiness of the project is considered by adjusting the expected cash flows. This approach eliminates the problems arising out of the inclusion of risk premium in the discounting process. The NPV of a project can be found out as follows:

$$NPV = \sum \frac{CE\,CFAT}{(1+i)^t} - CO$$

Under CE approach, the riskiness of the project is considered by adjusting the expected cash flows.

Where, CFAT = Expected cash flow after tax in year t

at = Certainty equivalent coefficient for year t

i = Risk less interest rate

CO = Cash outflows

t = No. of year

iii. **PD Approach :** Under this approach, probability ranging from 0 to 1 is assigned to expected cash flow. The cash flows which is assigned probability 1 is expected to occur certainly. The distribution of probability depends on the nature of cash flow such as dependent and independent cash flows. Under this approach, NPV of a project can be calculated as follows:

Under PD approach, probability ranging from 0 to 1 is assigned to expected cash flow.

$$NPV = \sum \frac{\overline{CFt}}{(1+i)^t} - CO$$

Where, $\overline{CFt}$ is the expected value of net CFAT in period t and I is the risk less rate of interest and CO is the cash outflows.

iv.   **DT Approach :** This approach considers the impact of all probabilistic estimates of the potential outcomes. In other words, every possible out come is weighted in probabilistic terms and then evaluated. A decision tree is a pictorial representation of the estimated out comes in tree form which indicates the magnitude probability and interrelationship of all out comes.

DT approach considers the impact of all probabilistic estimates of the potential outcomes.

Problems and Solutions

Problem –1

The Delta corporation is considering an investment in one of the two mutually exclusive proposals, Project A involving an initial outlay of Tk. 1,70,000 and Project B involving Tk. 1,50,000. The certainty equivalent approach is used in evaluating risky investments. The current yield on treasury bills is 5% and the company uses this as the risk less arte. The relevant information are as follows:

Year	Project - A		Project - B	
	Cash flow (Tk.)	Certainty-equivalent	Cash flow (Tk.)	Certainty-equivalent
1	90,000	0.8	90,000	0.9
2	1,00,000	0.7	90,000	0.8
3	1,10,000	0.5	1,00,000	0.6

i)   Which project should be acceptable to the company?

ii)   Which project is riskier? How do you know?

iii)   If the company was to use the risk – adjusted discount rate method, which project would be analyzed with higher rate?

Solution

i) **Determination of NPV of Project A :**

Year	CFAT (Tk.)	CE	Adjusted CFAT (CFATxCE) (Tk.)	PV factor at 5%	Total PV (Tk.)
1	90,000	0.8	72,000	0.952	68,544
2	1,00,000	0.7	70,000	0.907	63,490
3	1,10,000	0.5	55,000	0.864	47,520
					1,79,554
Less Initial outlay					- 1,70,000
NPV					9,554

ii) **Determination of NPV of Project B:**

Year	CFAT (Tk.)	CE	Adjusted CFAT (CFATxCE) (Tk.)	PV factor at 5%	Total PV (Tk.)
1	90,000	0.9	81,000	0.952	77,112
2	90,000	0.8	72,000	0.907	65,304
3	1,00,000	0.6	60,000	0.864	51,840 0
					1,94,256
Less Initial outlay					- 1,50,000
NPV					44,256

The NPV being greater, Project B should be acceptable to the company.

ii.	Project A is riskier. It is because certainty equivalents associated with expected CFAT of project A are lower than those of project B.

iii.	Project A being more risky would be analyzed using a higher discount arte, if the company was to use the risk – adjusted discount rate method.

Problem – 2

A company is considering two mutually exclusive projects S and T. Project S costs Tk. 30,000 and project T Tk. 36,000. The following particulars relate to these projects:

Project S		Project T	
CFAT (Tk.)	Probability	CFAT (Tk.)	Probability
3,000	0.1	3,000	0.2
6,000	0.4	6,000	0.3
12,000	0.4	12,000	0.3
15,000	0.1	15,000	0.2

Required:

i.	Compute the expected cash flows of the projects.

ii.	Compute the risk attached to each project.

iii.	Which project do you consider more risky and why?

Solution

i.   **Expected CF**

Project S			Project T		
CFAT (Tk.)	**Probability**	**Expected CF**	**CFAT (Tk.)**	**Probability**	**Expected CF**
3,000	0.1	300	3,000	0.2	600
6,000	0.4	2,400	6,000	0.3	18,00
12,000	0.4	4,800	12,000	0.3	3,600
15,000	0.1	1,500	15,000	0.2	3,000
Expected $\overline{CF}$		**9,000**	**Expected** $\overline{CF}$		**9,000**

ii.   **Standard Deviation of Each Project**

Project S

CF	$\overline{CF}$	$(CF - \overline{CF})^2$	Pi	$(CF - \overline{CF})^2$ x Pi
3,000	9,000	3,60,00,000	0.1	36,00,000
6,000	9,000	90,00,000	0.4	36,00,000
12,000	9,000	90,00,000	0.4	36,00,000
15,000	9,000	3,60,00,000	0.1	36,00,000
				1,44,00,000

Project T

CF	$\overline{CF}$	$(CF - \overline{CF})^2$	Pi	$(CF - \overline{CF})^2$ x Pi
3,000	9,000	3,60,00,000	0.2	72,00,000
6,000	9,000	90,00,000	0.3	27,00,000
12,000	9,000	90,00,000	0.3	27,00,000
15,000	9,000	3,60,00,000	0.2	72,00,000
				1,98,00,000

$$\sigma S = \sqrt{1,44,00000} = 3,795$$

$$\sigma T = \sqrt{198,00,000} = 4,450$$

iii.   Risk of the projects is to be determined with reference to coefficient of variation (CV).

$$CV = \frac{\sigma}{\overline{CF}}$$

$$CV_S = \frac{Tk.3795}{9000} = 0.42$$

$$CV_T = \frac{Tk.4450}{9000} = 0.49$$

Comment: Project T is more risky, because of higher coefficient of variation.

Review Questions:

Short Questions

1. Explain the concepts of risk and uncertainty.

2. Point out the major elements of risk and uncertainty .

3. What is a sensitivity analysis? Point outs its merits and demerits.

4. What similarities are there between the risk adjusted discount rate and certainty equivalent?

5. Distinguish between the risk adjusted discount rate and certainty equivalent?

6. How is risk assessed for a particular investment by using a probability distribution?

Broad Question

7. What are the techniques of measuring risk.? Explain each of them.

8.   Discuss the approaches used in evaluating risk.

9. Distinguish between standard deviation and coefficient of variation in the context of risk measurement. Which of these two is better and why?

Review Problem

Problem – 1

The probability distributions of two projects cash flows are given below

Project X		Project Y	
CF	Probability	CF	Probability
5,000	0.2	2,500	0.1
7,500	0.4	7,000	0.2
10,000	0.3	12,000	0.5
15,000	0.1	16,000	0.2

Calculate the expected CF, the standard deviation and coefficient of variation of each projects. Which of these two mutually exclusive projects do you prefer? And Why?

Problem – 2

The following information relate to Project A and B

Year	Project A		Project B	
	CF	**Certainty Equivalent**	**CF**	**Certainty Equivalent**
1	90,000	0.8	80,000	0.7
2	1,00,000	0.7	87,000	0.9
3	1,10,000	0.5	1,00,000	0.6
4	1,15,000	0.6	1,12,000	0.5

Required:

i. Which project is acceptable?

ii. Which project is riskier and why?

Lesson-5: Cost of Capital

On successful completion of the lesson 5, you should be able -

- To grasp the concepts of cost of capital & other related costs;

- To realize the significance of the cost of capital;

- To understand the factors influencing the cost of capital;

- To understand the techniques of computation of cost of capital – component-wise, overall and marginal;

- To identify the problems involved in determining cost of capital and

- To know the methods used in the computation of cost of capital.

Concepts of Cost of Capital & Other Related Costs

Cost of Capital

Cost of capital may be defined as the minimum rate of return an investor would be willing to accept for investing funds in a particular project. In other words, the cost of capital is the minimum rate of return required on investment projects to keep the market value per share unchanged. It is observed that the cost of capital is a topic of serious controversy. The cost of capital interacts with hypothesis about risk, capital structure and market valuation. The relationship between cost of capital and valuation was recognized by an author who suggested that attempts to define and measure this cost must await the formulation of a viable theory of Security Valuation. The conceptual difficulty in the determination of cost of capital arises from the existence of uncertainty and the variety of financial instruments employed in the market.

Cost of capital may be defined as the minimum rate of return an investor would be willing to accept for investing funds in a particular project.

Explicit and Implicit Costs

A firm can raise funds by issuing equity; debt, preferred stock, retained earnings or selling fixed assets etc. All these financing opportunities are known as sources of capital in the capital structure. Cost of capital may be explicit or implicit. The explicit cost of any source of capital may be defined as the discount rate that equates the present value of cash inflows that are incremental to taking of the financing opportunity with the present value of its incremental cash outflows. Such cash outflows may be interest payments, repayment of principal or dividends. In other words, the explicit cost for use of any fund is the discount rate that equates the present value of the incremental cash inflows and outflows involved in a financing opportunity. Such cost of capital refers to the minimum required return from a specific investment opportunity and arises when the capital is raised.

The explicit cost for use of any fund is the discount rate that equates the present value of the incremental cash inflows and outflows involved in a financing opportunity.

The implicit cost of capital arises when the firm considers alternative uses of funds to be raised. The implicit cost is nothing but the opportunity cost. It encompasses the expected rates of return on other investments by the firms or by the shareholders. The implicit cost of capital may be defined as the rate associated with firms and shareholders' best investment opportunity, which will be forgone if a proposal is accepted.

The explicit and implicit costs are the two components of cost of capital concept. Whatever may be the source, implicit cost exists when funds are invested. Implicit cost of capital is also important while considering investments, whether they are financed by internal or external funds.

Historical and Future Costs

Historical costs are past costs incurred in the past. These are represented as the book values in the Balance Sheet. Such costs are irrelevant in decision-making. As for example, Tk. 1,00,000 spent for purchasing a machine.

On the other hand, future costs are those, which would be incurred in the future. As for example cost of debt capital will be incurred in the future when the firm procures debt capital. In case of decisions of cost of capital, returns from the use of capital and its costs are compared.

Specific and Combined Costs

Specific cost refers to cost of a specific source of capital, say cost of debt capital, cost of equity, cost of retained earnings and cost of preferred stock. On the other hand, combined cost refers to the sum total of the cost of specific sources with which the capital structure is composed of. It is otherwise known as weighted average cost of capital (WACC).

Significance of Cost of Capital

The knowledge of cost of capital is useful to the financial management in deciding about the method of financing at a given time.

The financial managers of the firms should know the cost of the firms' specific sources of finance in order to judge the available investment opportunities for planning of their capital structure. In order to increase the value of the firm, an investment must earn more than the cost of funds necessary to finance the investment. The knowledge of cost of capital is also useful to the financial management in deciding about the method of financing at a given time. Although cost is an important factor in such a decision; but equally important are the considerations of retaining control or avoiding of risk.

The importance of the determination of the cost of capital (K) under certainty and uncertainty is examined below:

World of Certainty

The returns from a project are as certain as the cost of capital for pure debt.

It is recognized that the cost of capital (K) is equal to the rate of interest under the conditions of perfect certainty. All proposals paying a certain return r >K should be accepted. In a world of certainty, there exists

hardly any difference between debt and equity capital. The returns from a project are as certain as the cost of capital for pure debt.

World of Uncertainty

When the assumption of complete certainty of return is relaxed, then the market rate of return or interest is not a sufficient measure of the cost of capital. The desired returns from an investment project are subject to uncertainty. By the same token, the effective cost of project needs to be estimated, with the estimates themselves subject to uncertainty. The contractual cost of project i.e., interest and borrowed funds are specific and certain. Hence, it is not possible to measure profitability by comparing uncertain estimates of benefits with certain costs. Besides this, a large portion of the financing is provided by internally acquired equity capital, whose cost cannot be measured with the market rate of interest.

The desired returns from an investment project are subject to uncertainty.

To sum up, cost of capital is significant in the financial decision making areas as a standard for:

(i)   Evaluating investment decision where cost of capital is considered as the minimum rate of returns on an investment project;

(ii)   Designing debt-equity policy;

(iii)   Appraising financial performance;

(iv)   Formulating dividend policy and

(v)   Determining investment in current assets.

Factors Influencing Cost of Capital Determination

The factors influencing the determination of cost of capital are discussed as follows :

The factors influencing the determination of cost of capital are business risk, financial risk, source of finance, tax, relative return, capital structure composition and dividend policy

(i)   Business Risk : Business risk is that which occurs from operating business of a firm. It is influenced among others, largely by fixed costs incurred. The higher the fixed costs, the greater will be the business risk and vice-versa. It is on of the important factors that influence the determination of cost of capital. The more the business risk, the higher will be the cost of capital.

(ii)   Financial Risk : Financial risk is one that an enterprise will be unable to satisfy its financial obligations. The risk that will reduce the financial resources of a firm is known as financial risk. The more the financial risk the higher will be the cost of capital.

(iii)   Source of Finance : There are various sources of finances namely internal sources and external sources. Cost of capital is largely dependent on these sources of finance. There are some sources which are relatively costly and, again, there are some sources which are relatively cheaper from the viewpoint of cost of capital.

(iv) Tax Aspect : Tax aspect, income tax as well as VAT also influences the determination of cost of capital of a firm.

(v) Relative Return : Relative return of a firm from its investment also influences the determination of cost of capital of that firm.

(vi) Capital Structure Composition : Capital structure composition i.e. debt-equity mix also affects the determination of cost of capital of a firm.

(vii) Dividend Policy : Dividend policy and Dividend payout and profit retention policies of a firm also influence the determination of cost of capital

Methods for Cost of Capital Determination

Methods of Determination of Cost of Equity Capital

Equity capital has its cost in the form of stock/ share transactions and dividend payments to the shareholders.

Equity capital has its cost in the form of stock/ share transactions and dividend payments to the shareholders. The important methods used in determination of cost of equity are -

(i) Primary rate of returns to investors by ICB, Mutual Fund, NSC etc.;
(ii) Primary rate of return plus risk premium;
(iii) Absolute sum like 10%, 12%, 15% and so on;
(iv) As calculated by dividend valuation model.

Methods of Determination of Cost of Retained Earning

Retained earning, although an internal source of capital has also its cost in the form of its opportunity cost.

Retained earning, although an internal source of capital has also its cost in the form of its opportunity cost. The important methods of determination of cost of retained earnings are -

(i) By equity capital with its cost;
(ii) By equity capital with its opportunity cost of using the fund by equity-holders;
(iii) By equity capital with dividend payment;
(iv) Absolute sum say 8%, 10%, 12% and so on.

Methods of Determination of Cost of Debt

The specific rate of interest on debt is known as cost of debt.

Debt is of two types namely long-term and short-term. Both of these debts have their respective cost. The specific rate of interest of these two types of debt is known as cost of debt. However, the important methods of determination of cost of debt are –

(i) Actual rate of interest;
(ii) Effective rate interest i.e. actual rate plus some premium;
(iii) Absolute sum like 9%, 10%, 12% and so on.

Methods of Determination of Overall Cost of Capital

In theory, there are two methods of determination of the overall cost of capital namely **:**

(i) Weighted average cost of capital and (ii) marginal cost of capital. In practice, there is another important method of measuring the overall cost of capital. This method is known as simple average cost.

Computation of Cost of Capital: Problems

The major problems involved are **:**

(a) Lack of price stability; (b) Determination of future dividend; (c) Indifference of capital market; (d) Difficulties in calculations; (e) Effective rate of interest; (f) Interest-free short-term loans' cost and (g) Determination of rate of dividend.

Computation of Cost of Capital: Formulas

Computation of Cost of Debt Capital

Debt capital cost = kd = Before tax cost of debt = Rate of interest.

Kdt = After tax cost = kd (1 – T)

Where T = Tax rate.

Computation of Cost of Preferred Stock

$$kps = \frac{DPs}{P_0 - F \text{ (floatation costs)}}$$ Where   Dps = Dividend on preferred stock
P_0 = Per share selling price

Computation of Cost of Retained Earnings

Where D_1 = Dividend on Equity Stock

$$kr = \frac{D_1}{P_0} + g$$ P_0 = Selling price per stock
g = Growth rate in dividend

Computation of Cost of Common Stock (Equity)

$$ke = \frac{D_1}{P_0 (1 - F)}$$ Where D_1 = Dividend on Equity
P_0 = Selling price per share
F = Floatation costs

Computation of Weighted Average Cost of Capital

WCC = Wd . kdt + Wps . kps + We . ke + Wr . kr

MCC and Its Computation

MCC is defined as the cost of the last dollar of new capital that the firm raises. The MCC increases as the firm raises more and more capital

MCC is defined as the cost of the last dollar of new capital that the firm raises.

during a given period. A graph of the MCC plotted against dollars raised is the MCC schedule.

$$MCC = K_e = \frac{D_1}{P_0\,(1 - F)} + g$$

Problems and Solutions

Problem - 1

The following tabulation gives earning per share figures for the Badrul Company during the preceding ten years. The firm's common stock, 78,00,000 shares outstanding, is now (January 1, 2000) selling for Tk.65 per share, and the expected dividend at the end of the current year (2000) is 55 percent of the 1999 EPS. Because investors expect past trends to continue, g can be based on the earnings growth rate (Note that nine years of growth are reflected in the data.)

Year	EPS	Year	EPS
1990	Tk.3.90	1995	Tk. 5.73
1991	4.21	1996	6.19
1992	4.55	1997	6.68
1993	4.91	1998	7.22
1994	5.31	1999	7.80

The current interest rate on new debt is nine percent. The firm's marginal tax rate is 40 percent. Its capital structure, considered to be optimal, is as follows :

Debt (long-term only)	Tk. 104,000,000
Common equity	156,000,000
Total liabilities and equity	Tk. 260,000,000

a. Calculate Badrul's after-tax cost of new debt and common equity, assuming that new equity comes only from retained earnings.

b. Calculate the cost of equity as $k_e = D_1/P_0 + g$.

c. Find Badrul's weighted average cost of capital, again assuming that no new common stock is sold and that all debt costs nine percent.

Solution

a) $Kdt = Kd\,(1 - T) = .09\,(1 - .40) = .054 = 5.4\%$

b) $Ke = \dfrac{D1}{P0} + g = \dfrac{4.29}{65} + .078 = .067 + .078 = .145 = 14.5\%$

c) WCC = WdKdt + Weke

$$= \frac{104}{260}(.054) + \frac{156}{260}(.145) = .0216 + .0870 = .1086 = 10.86\%$$

Problem - 2

A company has on its books the following figures and specific cost of each source of capital :

Source of Capital	Book Value Tk.	Market Value Tk.	Specific cost
Debt	4,00,000	3,80,000	5
Preference Capital	1,00,000	1,10,000	8
Equity Capital	6,00,000		15
Retained Earnings	2,00,000	12,00,000	13
	13,00,000	16,90,000	

Required:

Determination of WACC using i) Book Value weights and ii) Market Value Weights. How are they different? Can you think of a situation where WACC would be the same using either of the weights.

Solution

a) Determination of WACC using Book Value Weights

Source of Capital	Book Value	Specific Cost	Total Costs
Debt	4,00,000	0.05	20,000
Preference Capital	1,00,000	0.08	8,000
Equity Capital	6,00,000	0.15	90,000
Retained Earnings	2,00,000	0.13	26,000
	13,00,000		1,44,000

$$\therefore \ k_0 = \frac{\text{Total costs}}{\text{Total amount of Capital}} \times 100 = \frac{1,44,000}{13,00,000} \times 100 = 11.10\%$$

b) Determination of WACC using Market Value Weights

Source of Capital	Market Value Tk.	Specific Cost	Total Costs Tk.
Debt	3,80,000	.05	19,000
Preference Capital	1,10,000	.08	8,800
Equity Capital	9,00,000 (a)	.15	1,35,000
Retained Earnings	3,00,000 (a)	.13	39,000
	16,90,000		2,01,800

Total Costs   2,01,800
$K_0 =$ ---------------------- x 100 = ------------------ x 100 = 11.90%
Total Capital   16,90,000

The K0 based on market value is greater than K0 based on book value. Because, market value of equity funds is considerably larger than their book value. Since this source of fund has higher cost, the overall cost of capital increases.

* The WACC would be the same with book value weights and market value weights when there is no difference between book value and market value of sources used in raising the capital.

(a) Total market value of equity shares and retained earnings is apportioned three-fourths and one-fourth respectively on the basis of their book values.

Problem – 3

Burger Paints Corporation has a target capital structure of 40% debt and 60% common equity. The company expects to have Tk. 600 of after-tax income during the coming year and it plans to retain 40% of its earnings. The current stock price is Tk. 30 and the last dividend was Tk. 2 and dividend is expected to grow at a constant rate of 7%. New stock can be sold at a floatation cost of 25%> What will be the marginal cost of equity capital if the company raises a total of Tk. 500 new capital.

Solution

$$MCC = Ke = \frac{D1}{P0(1-F)} + g = \frac{2.00}{30(1-.25)} + .07 = \frac{2.00}{30 \times .75} + .07 = .089 + 0.70$$

$$= .159 = 15.9\%$$

Review Questions

A. Short Questions

1. What is cost of capital ? Illustrate.
2. What is WCC ? How it is computed ?
3. What is MCC ? How it is computed ?
4. What is cost of debt ? How it is calculated ?
5. What are the problems in determining cost of capital ?

B. Broad Questions

6. Explain the concepts of the following costs **:**
   (a) Historical Cost; (b) Future cost; (c) Implicit cost;
   (d) Explicit cost; (e) Specific cost and (f) Combined Cost
7. Discuss the significance of cost of capital in the context of a corporate firm.
8. Discuss the methods used in the determination of cost of the following types of capital -
   (a) Debt; (b) Equity; (c) Retained Earnings and (d) Overall capital.
9. Explain the factors that influence the determination of cost of capital.

Review Problems

Problem - 1

Lima Corporation has a target capital structure of 40% debt and 60% equity. The corporation expects to have Tk. 600 of after-tax income during the coming year and it plans to retain 40% of its earnings. The current stock price is $P_0 =$ Tk. 30 the last dividend was $D_0 =$ Tk. 2 and the dividend is expected to grow a constant rate of 7%. New stock can be sold at a floatation cost of $F = 25\%$. What will Lima Corporation's marginal cost of equity capital be, if it raises a total of Tk. 500 new capital?

Problem - 2

The Gupta Co.'s cost of capital (equity) is 16%. Its before-tax cost of debt is 13% and its marginal tax rate is 40%. Using the following Balance Sheet, calculate company's after-tax weighted average cost of capital.

Assets	Tk.	Liabilities and Equities	Tk.
Cash	120		1,152
Accounts Receivable	240		1,728
Inventories	360		
Net plant	2,160		
Total assets	2,880		2,880

Problem - 3

The following are the EPS for ABC Co. The Co.'s common stock, 7.8 million shares outstanding, is now (January, 2000) selling for Tk.65 per share and the expected dividend at the end of current year (2000) is 55% of 1999 EPS. Nine years growth rates are reflected in the data.

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
EPS	3.90	4.21	4.55	4.91	5.31	5.73	6.19	6.68	7.22	7.80

The current interest rate on new debt is 9%. The corporation's marginal tax rate is 40%. Its capital structure is considered to be optimal as follows **:**

	Taka
Debt	104,000,000
Common Equity	156,000,000
Total	260,000,000

Calculate :

(a)   After-tax cost of new debt

(b)   Cost of Equity

(c)   Weighted average cost of capital

Lesson–6: Value Creation Through Required Market Returns (RMR)

The following are the objectives of the lesson 6

- To understand the concept and foundations of value creation;

- To get acquainted with the methods of measuring required market returns;(RMR)

- To know the diversification of assets and total risks analysis and

- To know the process of evaluation of acquisitions.

Concept and Foundations of Value Creation

Value is created through capital investments by exploiting opportunities for excess returns, those providing returns in excess of what the financial markets required for the risk involved. By investing funds in projects and products, a firm creates value if the expected return exceeds the return required by the financial markets for the risks involved. Value creation helps maximizing the wealth of the shareholders. The foundations or avenues to value creations are**:** (i) Industry attractiveness and (ii) competitive advantages within an industry

Value is created through capital investments by exploiting opportunities for excess returns, those providing returns in excess of what the financial markets required for the risk involved.

(i) *Industry Attractiveness* : Favorable industry characteristics include the growth phase of a product cycle, barriers to entry, and other protective devices such as patents, temporary monopoly power, and/ or oligopoly pricing where nearly all competitors are profitable. Probably the most important of these are explicit, as well as implicit, barriers to entry. Industry attractiveness has to do with the relative position of an industry in the spectrum of return-generating possibilities.

(ii) *Competitive Advantage* : Competitive advantage involves the relative position of a company within an industry. The company could be multidivisional in which case competitive advantage needs to be judged industry by industry. The avenues to competitive advantage are several **:** cost advantage, marketing and price advantage, and superior organizational capability (corporate culture). Cost advantage has to do with the relative cost of producing and distributing a product or service, as well as with the utilization of assets (receivables, inventories, and fixed assets) through better asset turnover. Marketing and price advantage involve successful rolling out new products or services, differentiating them in the market place, and picking the proper price point on the demand curve.

The bedrock of excess returns resides in industry attractiveness and competitive advantage within an industry

Thus, industry attractiveness and competitive advantage are principal sources of value creation. The more favorable these are, the more likely the company is to have expected returns in excess of what the financial markets response for the risk involved.

Thus, industry attractiveness and competitive advantage are principal sources of value creation.

Methods of Measuring Required Market Returns

We can think of the required return as the cost of obtaining and retaining capital from investors. As we know, most investors are concerned with unavoidable risk, the risk that cannot be avoided by diversification of the stocks, bonds, and other financial assets they hold. The required rate of return on investment is the return on a risk-free asset plus the market price of the risk to the investor due to one or more factors.

Whatever may be the valuation model, for a given degree of risk the financial markets expect a company to earn a minimum required return commensurate with the risk involved. The greater the systematic, or unavoidable risk, the greater the return the financial markets expect of an investment opportunity. If product markets were perfect, one could not expect to find opportunities providing returns in excess of the return required by the financial markets. With imperfect product markets, however, it may be possible to find projects providing excess returns. In the parlance of economists, these excess returns are economic rents. Although competition among the firms tends to drive economic rents to zero, sufficient lags may allow them to be earned temporarily.

The opportunities may arise anywhere along the risk spectrum – in a safe, mature business or in a risky, growth-oriented business. As long as we have the required return right for project acceptance, value will be created. There is nothing magical about growth per se; it is the expected return of a project relative to the standard imposed by the financial markets that matters.

The following main methods may be used while measuring required market returns :

Market Model - CAPM

The required rate of return is the risk-free rate plus a premium for the systematic risk of the project.

The meaning of CAPM and the assumptions under CAPM have been explained earlier. CAPM is based on proposition that any asset's return should be equal to the risk-free rate of return plus a risk premium that reflects the asset's non-diversifiable risk, which cannot be eliminated due to economic, or market factors that systematically affect most firms. Hence, the required rate of return is the risk-free rate plus a premium for the systematic risk of the project. So, required rate of return is calculated using the following formula :

$$R_k = R_f + (\overline{R}m - R_f) \beta$$

Where : R_k = Required rate of return;

R_f = Risk-free rate ;

β = Beta and

$\overline{R}m$ = Market portfolio return.

Deriving Surrogate Required Rate of Return

The steps needed to derive a surrogate required rate of return on equity are :

i.   Determine a sample of companies that replicates as nearly as possible the business in which an investment is being contemplated. The matching will only be approximate.

ii.   Obtain the betas for each proxy company in the sample, if the CAPM is being used.

iii   Calculate the central tendency of the betas of the companies in the sample. Often the median is the best measure to use, because the arithmetic average is distorted by outliers.

iv.   Derive the required rate of return on equity using the proxy beta obtained in step iii , together with the expected return on the market portfolio, R_m, and the risk-free rate, R_f.

Modification for Leverage

When the leverage of the proxy company differs significantly from the leverage the firm wishes to employ, it may be desirable to adjust the beta of the proxy company. We are able to derive an adjusted beta for a security under the assumption of different proportions of debt than what occurs. We first estimate the beta for the stock *in the absence of leverage* and then adjust this figure for the proportion of leverage we wish to employ. The final result is an approximation of the beta that would prevail if the external company were to employ the desired proportion of debt. Again, it should be emphasized that the beta adjustment procedure is crude.

It assumes that capital markets are perfect except for the presence of corporate taxes. Indeed, the only adjustment, and a linear one at that, is for corporate taxes. Different imperfections will affect the beta adjustment formula differently, most reducing the adjustment made.

Weighted Average Required Return

The final step is to use the adjusted beta to determine the cost of equity capital for the project and then to go on to determine a weighted average required return. Consider now a situation where a company finances with instruments additional to equity. We need to bring their costs into a blended required rate of return. This return is a function not only of the business risk of the company but also of the way in which it chooses to finance itself.

WACC is a blended required return of the various capital costs making up capital structure

Once we have computed costs of individual components of the capital structure, we need to weight them according to some standard and calculate a weighted average cost of capital (WACC). The weights should correspond to market values of the various forms of financing that the corporations intend to employ. Because we are trying to maximize

the value of the firm to our shareholders, market-value weights, as opposed to book-value weights, are consistent with this objective.

Economic Value Added and Market Value Added

EVA is operating profits minus the required dollar-amount return for the capital employed.

Another way of expressing a company earning more than the financial markets require is through economic value added EVA), which is the residual income a company earns after capital costs are deducted. More specifically, it is operating profits minus the required dollar-amount return for the capital employed.

EVA enjoys popularity, as many executives prefer to have a dollar amount charge for the use of capital as opposed to a percent cost. The underlying idea is not new; it is simply the notion of earning returns in excess of what the financial markets require. To the extent a company finds that the concept better links corporate strategy and investments with shareholder value, it is a useful device.

MVA is the difference between a company's total market value (debt and equity) at a point in time minus the total capital invested in the company since its origin.

A related measure of wealth enhancement is the market value added (MVA). This is the difference between a company's total market value (debt and equity) at a point in time minus the total capital invested in the company since its origin. In another version of MVA only the common stock is considered; that is, the market value of the common stock less invested equity capital. This measure is related to market-to- book value(M/B) ratio, in that the same data are used to calculate both MVA and M/B.

Both the EVA and MVA measures use accounting book values as measures of invested capital. Efforts are made to adjust these values for such things as goodwill amortization, bad-debt reserves, deferred tax reserves, LIFO versus FIFO inventory valuation differences, and other things of this sort.

Adjusted Present Value

With an APV approach, project cash flows are broken down into two components : unlevered operating cash flows and those associated with financing the project.

An alternative to the WACC is the adjusted present-value method (APV), first proposed by Stewart C. Myers. With an APV approach, project cash flows are broken down into two components : unlevered operating cash flows and those associated with financing the project. These components then are valued so that -

APV = Unlevered value + Value of financing

The disaggregation of cash flows is undertaken so that different discount rates may be used. As operating cash flows are more risky, they are discounted at a higher rate.

More formally, the adjusted present value is -

$$APV = \sum_{t=0}^{n} \frac{OC_t}{(1+k_n)} + \sum_{t=0}^{n} \frac{Int_t(T_c)}{(1+K_j)t} - F$$

Where,

OC_t = after-tax operating cash flow in period t

k_u = required rate of return in the absence of leverage All-equity financing)

$Int._t$ = interest payment on debt in period t

T_c = corporate tax rate

k_i = cost of debt financing and

F = after-tax flotation cost associated with financing (debt, equity, or both)

The first component on the right-hand side of the equation represents the net present value of operating cash flows discounted at the unlevered cost of equity capital. The second component is the present value of the interest tax shield on any debt employed to finance the project. The discount rate is the corporate cost of borrowing, the idea being that the realization of the tax shield bears a risk comparable to that embraced in the cost of debt funds. Finally, any flotation costs are subtracted from the sum of the first two components.

Proxy Company Approach

In the latter approach, project-operating cash flows are discounted at the unlevered cost of equity, interest tax shields at the cost of borrowing, and flotation costs are subtracted form the sum of the present values. The idea is that there are two components to a project **:** its unlevered value and the net value of financing. The differences between the APV and WACC methods were explored, and it was determined that imperfections other than corporate taxes cloud the issue.

The proxy company approach to determining required rates of return is particularly appropriate when it comes to divisions of a multi-business company. If the products/projects of a division are relatively homogeneous with respect to risk, the required return derived for the division becomes its transfer price of capital.

Firm's overall Cost of Capital

When the various businesses of a company do not differ materially in systematic risk, it is unnecessary to derive individual project or division required returns. Instead the overall required return of a company, its WACC, can be used as the acceptance criterion for capital investments. Here the cost of equity capital is the minimum rate of return that a company must earn on the equity-financed portion of its investments in order to leave unchanged the market price of its stock. The cost can be estimated using a market model : CAPM, extended CAPM, or APT multifactor.

(i) Dividend Discount Model

Dividend discount model equates share price with the present value of expected future dividends.

Perpetual Growth Situation : If dividends per share are expected to grow at a constant rate, g, and k_e is greater than g, we discovered earlier that –

$$P_0 = \frac{D_1}{K_e - g}$$

Where D_1 is the dividend per share expected to be paid at the end of period 1. Thus, the cost of equity capital would be -

$$P_0 = \frac{D_1}{P_0} + g$$

The critical assumption, of course, is that dividends per share are expected to grow at a compound rate of g forever.

Diversification of Assets and Total Risk Analysis

The diversification of assets by a company is not a thing of value if the assumptions of the market models hold. Investors can diversify on their own and do not need the company to do it for them. The probability of insolvency is a function of total risk or variability of the company, the sum of both its systematic and unsystematic risks. If bankruptcy costs are significant and there is some probability of insolvency, a company may wish to pay attention to the impact of project selection on total risk. In portfolio framework, the trade-off between risk and expected NPV for different combinations of investments can be analyzed.

Evaluation of Acquisitions and Effect on total Risk

Pure diversification by a company through acquisitions is not a thing of value. The acquiring company must be able to affect operating economics, distribution economics, or other synergies if the acquisition is to be a thing of value.

However, an acquisition can enhance the value of the company to its shareholders. Indeed, economics may be involved that benefit the acquiring firm and its stockholders. The prospect of synergism may make a prospective acquisition more attractive to one company than to another, but diversification itself would not be beneficial. Conglomerate merger for the purpose of diversification would be suspect; they would not enhance shareholder wealth. If an acquisition is to be worthwhile, there must be the prospect of synergism. In other words, the acquiring company must be able to affect operating economics or other things of this sort if the acquisition is to be a thing of value. Acquisition creates value only if likely synergies more than offset the premium paid.

Effect on Total Risk

The acquisition then becomes one more investment proposal in a portfolio of projects to be considered. The methods of analysis and selection are the same as those employed earlier in this Lesson. Management chooses the best combination of expected net present value and risk. If the portfolios of projects represented by this combination include the prospective acquisition, the firm should acquire the company involved. In this way, an acquisition is evaluated in the same manner as any internally generated investment proposal. A decision is made with attention to the marginal impact of the acquisition on the total risk of the firm.

Acquisition creates value only if likely synergies more than offset the premium paid.

Problems and Solutions

Problem - 1

1. Determine the required return on equity for the following project situations, using the capital asset pricing model.

Situation	Expected Return Market Portfolio	Risk-Free Rate	Beta
1	15%	10%	1.00
2	18	14	0.70
3	15	8	1.20
4	17	11	0.80
5	16	10	1.90

What generalizations can you make ?

Solution

We know that under CAPM, required rate of return on equity (R_k) is calculated as follows :

$$R_k = R_f + (\overline{R}m - R_f) \beta$$

By using the formula, R_k is calculated in the following Table under the different situations.

Table Showing Calculations of R_k

Situation	Equation (value putting)	Required Return (R_k)
1	10% + (15% - 10%) x 1	15%
2	14% + (18% - 14%) x 0.70	16.8%
3	8% + (15% - 8%) x 1.20	16.4
4	11% + (17% - 11%) x 0.80	15.8
5	10% + (16% - 10%) x 1.90	21.4

Comment (Generalization)

The greater the risk-free rate, the greater the expected return on the market portfolio and the greater the beta, the greater will be the required return on equity, all other things being the same. In addition, the greater the market risk premium ($\overline{R}m - R_f$), the greater the required return, all other things being the same.

Problem - 2

Silicon Wafer Company presently pays a dividend of 41. This dividend is expected to grow at a 20 percent rate for 5 years and at 10 percent per annum thereafter. The present market price per share is $20. Using a dividend discount model approach to estimating capital costs, what is the company's expected, or required, return on equity?

Solution

We know that under perpetual growth situation, cost of equity capital (k_e) = $\dfrac{D_1}{P_0} + g$

$$\text{Where,} \quad P0 = \frac{D_1}{K_e - g}$$

Through trial and error, one ends up using 18 percent and 19 percent as discount rates.

End of Year	Dividend per Share	Present Value at 18%	Present Value at 19%
1	$1.02	$1.02	$1.01
2	1.44	1.03	1.02
3	1.73	1.05	1.03
4	2.07	1.07	1.03
5	2.49	1.09	1.04

Year 6 dividend = $2.49 (1.10) = $2.74

Market prices at the end of year 5 using a perpetual growth dividend valuation model :

$$P_5 = \frac{\$2.74}{0.18 - 0.10} = \$34.25 \qquad P_5 = \frac{\$2.74}{0.19 - 0.10} = \$30.44$$

Present value at time 0 for amounts received at end of year 5 :

$34.25 at 18% = $14.97 $30.44 at 19% = $12.76

	18%	19%
Present value of 1 – 5 years	$ 5.26	$ 5.13
Present value of 6 – α years	14.97	12.76
	$20.23	$17.89

Therefore, the discount rate is closer to 18 percent than it is to 19 percent.

Interpreting

$$K_e = 18\% + \frac{0.23}{20.23 - 17.89} = 18.10$$

and this is the estimated return on equity that the market requires.

Problem - 3

You are evaluating two separate projects as to their effect on the total risk and return of your corporation. The projects are expected to result in the following (in thousands) :

	Net Present Value of Company	Standard Deviation
Existing projects only	$6,000	$3,000
Plus project 1	7,500	4,500
Plus project 2	8,200	5,000
Plus projects 1 and 2	9,700	6,100

a.   Would you invest in one or both projects?

b.   What would you do if a CAPM approach to the problem suggested a different decision?

School of Business

Solution

a.   The coefficients variation (Standard Deviation/NPV) for the alternatives are

Existing Projects	0.50
Plus project 1	0.60
Plus project 2	0.61
Plus project 1 and 2	0.63

The coefficient of variation increases with either or both investments. A reasonably risk-averse decision maker will prefer the existing projects to any combination of new project additions to existing projects. If this is the case, both the new projects will be rejected. The actual decision will depend on your risk preferences. Presumably, these preferences will be influenced by the presence of bankruptcy costs.

b.   If the CAPM approach gives an opposite decision, the key to deciding would be the importance of market imperfections. As indicated earlier, if a company's stock is traded in imperfect markets, if the possibility of insolvency is substantive, and if bankruptcy costs are significant, more reliance should be placed on a total variability approach because it recognizes residual plus systematic risk. If things point in the opposite direction, more reliance should be placed on the CAPM results.

Problem - 4

Grove Plowing Inc., is considering investing in a new snowplow truck costing $30,000. The truck is likely to provide a cash return after taxes of $10,000 per year for 6years. The unleveled cost of equity capital of the company is 16 percent. The company intends to finance the project with 60 percent debt, which will bear an interest rate of 12 percent. The loan will be repaid in equal annual principal payments at the end of each of the 6 years. Flotation costs on financing amount to $1,000, and the company is in a 30 percent tax bracket.

a.   What is the adjusted present value (APV) of the project? Is the project acceptable?

b.   What would happen if expected after-tax cash flows were $8,000 per year instead of $10,000 ?

Solution

a. We know that APV = $\sum_{t=0}^{n} \dfrac{OC_t}{(1+k_i)} + \sum_{t=0}^{n} \dfrac{Int_t(T_c)}{(1+K_j)} - F$

$= \sum_{t=0}^{n} \dfrac{10,000}{(1+0.16)6} + \sum_{t=0}^{n} \dfrac{12\% \, on \,(60\% \, of \, 30,000) \, x \, 0.30}{(1+0.12)6} - 1,000$

$= \dfrac{10,000}{2.436} + \dfrac{2,160 \, x \, 0.30}{1.974} - 1,000$

$= 4105.09 + 328.27 - 1,000$

$= \underline{3,433.36}$

Comment **:** Since project produces positive APV; so it is acceptable.

b. APV $= \sum_{t=0}^{6} \dfrac{8,000}{(1+1.16)^6} + \sum_{t=0}^{n} \dfrac{12\% \, on \,(60\% \, of \, 30,000) \, x \, 0.30}{(1+1.16)^6} - 1,000$

$= 3,284.07 + 328.27 - 1,000$

$= \$\underline{2,612.34}$

Comment **:** Since in this case also the project produces positive APV, so it is acceptable.

Review Questions

Short Questions

1. Discuss the concept of creating value. What is its main purpose?
2. How surrogate returns are derived?
3. How would you adjust Beta for leverage?
4. What is weighted average required return?
5. Distinguish between EVA and MVA.
6. What is adjusted present value?
7. How would you evaluate acquisitions?

Broad Questions

8. What are the foundations of value creation? Explain each of them.

9. What are methods used in measuring required market returns? Explain each of them.

10. What is diversification of assets by a firm? How would you diversify the assets of your firm? Explain.

11. What is total risk of a firm? How would you calculate it? Explain.

Review Problems

Problem - 1

Acosta Sugar Company has estimated that the overall return for Standard and Poor's 500-stock Index will be 15 percent over the next 10 years. The company also feels that the interest rate on Treasury securities will average 10 percent over this interval. The company is thinking of expanding into a new product line : almonds. It has had no experience in this line but has been able to obtain information on various companies involved in producing and processing nuts. Although no company examined produces only almonds, Acosta's management feels that the beta for such a company would be 1.10 once the almond operation was ongoing. There is some uncertainty about the beta that will actually prevail. Management has attached the following probabilities to possible outcomes :

Probability	.2	.3	.2	.2	.1
Beta	1.00	1.10	1.20	1.30	1.40

a. What is the required rate of return for the project using the mode beta of 1.10 ?

b. What is the range of required rates of return?

c. What is the expected value of required rate of return?

Problem - 2

Willie Sutton Bank Vault Company has a debt-equity ratio (market value) of 0.75. Its present cost of debt funds is 15 percent, and it has a marginal tax rate of 40 percent. Williie Sutton Bank Vault is eyeing the

automated bank teller business, a field that involves electronics and is considerably different from its own, so the company is looking for a benchmark or proxy company. The Peereless Machine Company, whose stock is publicly traded, produces only automated teller equipment. Peerless has a debt-to-equity ratio of 0.25, a beta of 1.15, and an effective tax rate of 40 percent.

a. If Willie Sutton Bank Vault Company wishes to enter the automated bank teller business, what systematic risk (beta) is involved if it intends to employ the same amount of leverage in the new venture as it presently employs ?

b. If the risk-free rate presently is 13 percent and the expected return on the market portfolio is 17 percent, what return should the company require for the project if it uses a CAPM approach?

Problem - 3

On March 10, International Copy Machines (ICOM), one of the "favorites" of the stock market, was priced at $300 per share. This price was price was based on an expected annual growth rate of at least 20 percent for quite some time in the future. In July, economic indicators turned down, and investors revised downward t 15 percent their estimate for growth ICOM. What should happen to the price of the stock? Assume the following:

a. A perpetual-growth valuation mode is a reasonable representation of the way the market values ICOM

b. The firm does not change its dividend, the risk complexion of its assets, or its degree of financial leverage.

c. The dividend next year will be $3 per share.

Problem- 4

Grove Plowing Inc., is considering investing a new snowplow truck costing $50,000. The truck is likely to provide a cash return after taxes of $15,000 per year for 10 years. The unlevered cost of equity capital of the company is16 percent. The company intends to finance the project with 70 percent debt, which will bear an interest rate of 12 percent. The loan will be repaid in equal annual principal payments at the end of each of the 10 years. Flotation costs on financing amount to $1,500, and the company is in a 40 percent tax bracket.

a. What is the adjusted present value (APV) of the project? Is the project acceptable?

b. What would happen if expected after-tax cash flows were $8,000 per year instead of $15,000?