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John A. Doukas, *Editor*

Capital Budgeting

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Abstract

Capital budgeting is an important pat of the financial management of a business organization. It is a process that business houses use to evaluate an investment project. The decision of whether to accept or deny an investment project is capital budgeting decision. Capital budgeting is important because it determines the long-term economic and financial profitability of any investment project. It lays down the future success of a business. The present book aims to develop not only an understanding of the concepts of capital budgeting but also to provide its practical application to help the students to learn both theory and practice of capital budgeting to be used in the financial management of a business organization. It analyzes the capital budgeting practices of corporate enterprises in India in diverse sectors, on comparative basis in order to provide the readers a better insight into the various issues and challenges regarding capital budgeting management.

Keywords

capital budgeting, capital expenditure, financial management, business organization, corporate enterprises

Contents

Preface

Financial management is one of the most essential areas of any organization. It begins with investment decision in long-term assets, that is, capital budgeting decision. Capital budgeting decision lays down the foundation stone of the financial management. That's why the success of financial management depends on right capital budgeting application.

It is against this backdrop that the present book has been attempted. Its focus is to highlight the importance of an efficient capital budgeting decision in managing finances of a business enterprise. The objective of the book is, to develop not only an understanding of the concepts of capital budgeting but also to provide its practical dimension to help students to learn both theory and practice of capital budgeting to be used in the financial management of a business organization. Further, it will be useful to the managers to use it as an effective tool for resource allocation and evaluation of the business viability.

It also analyzes the capital budgeting practices of corporate enterprises in India in diverse sectors, on comparative basis in order to have a better insight into the various issues and challenges regarding capital budgeting management.

The present book is divided into six parts. Part I gives an overview of the conceptual framework of financial management. Part II discusses the nature and scope of capital budgeting decision along with project feasibility process and techniques. Part III contains a detailed discussion on the aspect of time value of money, capital budgeting appraisal techniques, and risk mitigation methods. Part IV discusses the financing aspect of capital investment decision by the business units. Part V comprises the international perspective of capital budgeting decision. Part VI is the case-study discussion of the capital budgeting concept. It analyzes the capital budgeting practices of companies, like Reliance Industries Ltd., ONGC Ltd., Vizag Steel Ltd., and Cairns India on comparative basis. It examines their fixed assets structure to see the level of investment made in fixed assets and their efficiency in utilization.

It is hoped that it would create a fresh knowledge base thereof to the academia and provide direction to the business and policy makers to effectively cope with emerging financial challenges related to capital budgeting practices at the global level.

I wish to thank God Almighty for everything in life! The work would be incomplete if I do not acknowledge my parents' contribution. They have been a constant source of inspiration for me and have always stood by me through thick and thin.

My wife provided her unstinted support and encouragement in completing the book. My little daughter Maanya is my soul whose smile always keeps me going in life.

Last, but not the least, I am thankful to the entire team of Business Expert Press for their tremendous support and whole hearted cooperation at all stages of publication of this book.

I am confident that the readers will find this book truly valuable in terms of its quality and presentation. Any constructive comments and suggestions for improving the contents of the book will be highly appreciated.

SECTION 1

Introduction

CHAPTER 1

Nature of Financial Management

The Present Chapter

It discusses the concept of financial management, its scope with its importance and objectives. There is an overview of the various financial problems faced by business enterprises as well.

Introduction

Almost everything in life eventually boils down to the rupee sign, so the adage goes. Money, and therefore, finance, is an integral part of life.[1] Business is no exception to it. It needs to have an efficient financial management not only in totality but also in segmental performance. Hence, growth of every business enterprise is closely linked with efficient management of its finance.

Meaning of Financial Management

Financial management refers to the process of raising and allocation of funds. It is the sum total of planning, organizing, directing, and controlling the financial activities of the enterprise.

[1]Douglas R. Emery, et al., *Principles of Financial Management.* (New Jersey: Prentice Hall, 1998), 2.

Elements

1. *Investment decision:* It refers to the allocation of funds in various assets. The investment in fixed assets is called as "capital budgeting decision." The investment in current assets is called as "working capital decision."
2. *Financing decision:* It involves funds' raising from various sources based on various factors, like the cost of funds, time- period, flexibility, and so on. It is about determining the "financial structure" of an enterprise.
3. *Dividend decision:* It is the decision about distribution of net profit. The finance manager decides how much quantum of profits to be distributed as dividend to shareholders and how much to be retained for future contingencies.

Objectives of Financial Management

The main objectives of financial management are:

1. **Profit maximization**: It is considered to be the primary objective of financial management. Every business enterprise aims to earn maximum profit, both short-term and long- term.
2. **Wealth maximization**: Wealth maximization (shareholders' value maximization) is the key objective of financial management *which is preferred over profit maximization on account of shareholders' value creation, particularly in case of a listed company.* Wealth maximization implies both regular returns to shareholders in the form of dividend and increase in the market value of the shares by high performance of the company.
3. **Liquidity**: Cash is the king for any organization. Maintaining sound liquidity is one of the most important objectives of financial management. The firm must have a sound cash position for day-to-day expenses, like paying salaries, rent, electricity bills, etc. If the firm does not have enough liquidity, the survival of the firm is always under threat.
4. **Solvency**: Long-term soundness is the most important objective of financial management. The company must be solvent to pay interest

and repay loans at regular intervals; only then the company will survive in the competitive world.

Functions of Financial Management

Following are the main functions of financial management:

1. **Estimation of financial requirements**: Proper estimation of financial requirements is a very important function of financial management. The finance manager must find out how much finance is required for the operations of the company, according to the fixed capital and working capital requirements.
2. **Proper mobilization of funds**: Mobilization (collection) of funds is another important function of financial management. After estimating the financial requirements, the finance manager must decide on the sources of finance. The finance can be raised from various sources such as shares, debentures, bank loans, and so on. There must be a proper balance between owned funds and borrowed funds.
3. **Efficient utilization of finance**: Once the funds are raised, the next task of finance manager is to utilize them efficiently. Long-term funds should be invested in fixed assets and short-term funds should be used for current assets. The company's funds should not be invested in the unprofitable projects.
4. **Distribution of profits**: The distribution of net profit has to be decided by the finance manager. He has to decide between dividend and reinvestment of earnings, keeping in view the requirements of shareholders and expansion and diversification plans of the company.
5. **Cash management**: Finance manager also has to decide about the cash required for various requirements of the firm. Cash is required for many purposes like payment of wages and salaries, bills, meeting current liabilities, and so on.
6. **Financial control**: Maintaining financial controls is a very important function of a finance manager. This is exercised with the help of techniques like ratio analysis, budgetary control, cost analysis, and so on.

Financial Management for Businesses in India

Gone are the days when there used to be a single manager who would manage the entire operations of a business. With multinationals around, the finance function has become much more specialized and complex. There are specialists who look after specialized categories of operations.

Since liberalization in 1991, the face of Indian corporate has changed tremendously. Finance is the essence of management of any business. It is in this context financial management for businesses in India is seen. Today every company has specialist set of people shouldering the responsibility of finance manager in their organization. Different connotations are used for finance manager by different companies, viz. Director-Finance, President-Finance, Chief Finance Officer, Financial Controller, and so on.

Today's finance manager does not perform the routine function of raising and disbursement of funds anymore. He has to do multitasking for the overall growth of the business. He has to safeguard the financial assets of the company, plan the business operations in a way so that there is a positive cash flow. In his day-to-day responsibilities, he has to look at the audit reports, and final accounts for analyzing the performance of the company.

Financial management is a process that is associated with both planning and control. As *planning,* it involves procuring and allocation of available funds in a most profitable manner. *Control* on the other hand refers to keeping an eye on the cash flow. A finance manager is thus responsible for the total management of funds in an enterprise. In nutshell, financial management for businesses has become very scientific in India with the latest techniques of management around.

In any organization, finance manager has to use the available resources in the most efficient manner so as to generate maximum profits for the company and keep shareholders happy. This leads to realization of the ultimate organizational objective of shareholders' wealth maximization.

In conclusion, financial management has changed with the changing times and become very scientific for efficient management of business organizations with the latest principles and practices of management being followed.

Financial Management Problems & Solutions

The problems relating to the financial management faced by corporate enterprises and their possible solutions may be reiterated below:

1. The enterprises sometimes due to *poor planning*, fail to identify and maintain the desirable combination of sources of funds. They face the problem of shortage of equity and depend too much on the borrowed capital. Hence, there is a necessity of proper financial planning to make the financial structure optimal.
2. Likewise, the enterprises also maintain an *inappropriate combination of assets*. This results in the problem of either underinvestment or overinvestment in fixed assets on one hand and current assets, particularly in inventories and receivables, on the other hand. In such condition, the inventories and receivables are to be checked by way of adopting the appropriate inventory controlling techniques and altering credit and collection policies suitably. There should be a more efficient utilization of assets.
3. The enterprises *fail in making proper future projection of revenues and costs* which result in improper investment in inventories receivables, and additional plant capacity, and so on. All these factors ultimately account for poor earnings of the enterprises.

Hence, there is a need for a sound profit planning for ensuring better utilization of resources and enhanced earnings.

4. The enterprises *lack a definite and stable dividend policy*. No adequate balance is maintained between payment of dividends and retention of earnings. There should be more regularity and consistency in payment of dividends in proportion to their equity capital.
5. The enterprises should be *managed by only professionally competent, qualified, and experienced personnel* based on the practice of participative management and supported by an efficient information system.

SECTION 2

Capital Budgeting Decision & Appraisal

CHAPTER 2

Capital Budgeting: Nature & Scope

The Present Chapter

It discusses the concept of capital budgeting, its process, techniques, and risk analysis of capital investment decisions by the business units.

Introduction

Capital budgeting decision relates to decision of investment in long-term projects. Capital budgeting is often used interchangeably with capital expenditure or capital investment. Any expenditure that generates a cash flow benefit for more than one year, it is a capital expenditure. For example, the purchase of new equipment, expansion of production capacity, buying another company, research & development, and so on. Capital budgeting involves large cash outlays for generating future return of the company. Once, a capital budgeting decision is committed, it is often difficult to reverse. Therefore, we need to carefully analyze and evaluate proposed capital budgeting decisions.

"Capital Budgeting is long-term planning for making and financing proposed capital outlays."

—Charles T. Horngnen

"Capital budgeting is concerned with the firm's formal process for the acquisition and investment of capital."

—Hamption, John. J.

In a capital investment decision, the major criterion for selection of a project is its viability and impact on shareholder value. The two most important parameters for arriving at a project decision are the project's expected cash inflows and outflows. They determine whether the returns meet a sufficient target benchmark or not.

Capital Budgeting Decision: An Overview

The capital budgeting decision, as already pointed out, pertains to investment in fixed assets/long-term assets and the returns are expected over a long period of time. It is the process of identifying, analyzing, and selecting investment projects whose returns (cash flows) are expected to extend beyond one year.[1] Capital budgeting is a continuous process and is carried out by different functional areas of management such as production, marketing, engineering, financial management, and so on.

The investment decision regarding these assets or proposals is the most challenging and complex. In the long run, the success of an enterprise is judged by the effectiveness with which the management employs the available resources to fixed assets for getting the desired returns.

It is worthwhile to mention here that long-term funds are invested in procuring fixed assets. So, capital budgeting decision is, usually, financed by long-term funds.

In brief, the capital budgeting decision can be broken down into:

a. Allocation of long-term funds among fixed assets/long-term assets,
b. Risk analysis of these investment decisions, and
c. Measurement of the cost of capital.

On the basis of preceding discussion, the following basic features of capital budgeting can be drawn:

[1.] James C. Van Horne, et al., *Fundamentals of Financial Management,* 9th ed. (New Delhi: Prentice-Hall, 1996), 314.

i. Capital budgeting decisions have long-term implications.
ii. These decisions involve substantial commitment of funds.
iii. These decisions are usually irreversible.
iv. These decisions determine the future growth of the firm.
v. They involve a high degree of risk.
vi. They involve a relatively long-term period between the initial outlay and the anticipated return.

The various types of capital investment decisions are:

- Fresh investment in a long-term asset;
- Replacement of an asset;
- Expansion of the production capacity;
- Diversification of business;
- Modernization of existing facilities;
- Continuation or discontinuation of an existing product line;
- R&D activities.

Importance of Capital Budgeting Decision

The foremost importance is that the capital is a limited resource which is true of any form of capital, whether it is raised through debt or equity. The firms always face the constraint of capital rationing. This may result in the selection of less profitable investment proposals due to budget allocation and resource constraints. So the management should be cautious in deciding whether a particular project is economically acceptable and within the specified limits of the investments to be made during a specified period of time. In case of more than one project, management must identify the most suitable one or a combination of investment projects that will contribute to the value of the firm and profitability. This is the essence of capital budgeting.

Concept of Fixed Assets

Fixed assets are those that are acquired for continued use and are not meant for resale though they may be disposed off later. Finney defines, "Fixed Assets are the assets of a relatively permanent nature, used in the

operation of a business undertaking."[2] For the manufacturing firms, they are the most essential resource since production is not possible without them. They are often referred to economic resources as they provide the basis for the firm's earning power and value.

Fixed assets may be tangible and intangible. **Tangible fixed assets** are those which can be seen and felt, like land and building, plant and machinery, equipment, furniture, and so on. They are key to production and used over a considerable period of time, and are not meant for sale. These assets are consumed slowly in the production process and are replaced when either their utility is exhausted or they become obsolete. **Intangible fixed assets** are the assets which cannot be seen or felt, having no physical existence in themselves, rather they have right to enjoy the privileges. Examples of such assets include goodwill, patents, copyrights, trademarks, trade names, designs, franchises, and so on. These intangible assets derive their value from the economic benefit they yield to.

Capital Budgeting Process

The capital budgeting process includes the following steps:

1. **Preliminary screening of ideas**: The first step is to identify the need or opportunity for an investment. This is usually done at the mid-management level which is communicated to the senior management which then evaluates the merit of the proposed opportunity and decides whether to go for the investment or not? There are various factors which are considered while arriving at a decision, like financial outlay, market factors, and most importantly risk-return.
2. **Feasibility study of the proposal**: Next step is to conduct a feasibility study of the proposal for its economic viability, commercial viability, technical viability, and the financial viability.
3. **Capital project evaluation**: At this stage the evaluation of the proposed project is done for its decision making. Both quantitative and qualitative factors are considered for the exercise. The target cost of

[2]HA.Finney, et al., *Principles of Accounting—An Introduction.* (Japan: Prentice Hall, 1972), 287.

capital, estimated cash flows, and potential risks are identified for evaluation purpose. Calculating the appropriate discount rate and cash flows is a critical part of this process. Following measures are used for the appraisal:

i. *Net income from the operations:* is the amount of cash flows (out and then in) from the capital investment decision;
ii. *Salvage value:* of an existing asset when replacing it with a new asset;
iii. *Depreciation:* the usage charge of an asset;
iv. *Income tax effects:* need to be considered based on the type of the firm;
v. *Inflation:* needs to be considered in estimating cash flows;
vi. *Risk considerations:* political risk, monetary risk, and other risks should be considered in the evaluation process.

4. **Capital decision making**: Once, the proposed project comes out to be the viable project, it is decided to go ahead with it. At this stage, the process of execution commences.

Types of Capital Budgeting Projects

The capital investment projects are classified as follows:

A. Based on Nature

1. **Replacement decision**: It involves decision concerning whether an existing asset should be replaced by a newer one of the same type or with a different type of machine with the same operational use. Such replacements are generally made to maintain existing levels of operations, although it might affect the profitability due to changes in expenses (the new machine might be either more expensive or cheaper to operate than the existing machine).
2. **Expansion decision**: It is a decision regarding whether the firm should increase its production capacity and operations by adding new products, additional machines, and so on.
3. **Diversification decision**: It is deciding to entering into new lines of business either product wise or territory wise. Such decisions are inevitably related to increasing requirement of fixed assets.

B. Based on Exclusiveness

1. **Independent projects**: The acceptance of an independent project does not affect the acceptance of any other project, that is, the selection of a project does not affect other projects. For example, you have Rs.100,000. You decide you are going to buy a bike that costs about Rs.30,000 and a new sofa set for your house that costs around Rs.10,000. The decision to buy the bike does not affect the decision to buy the sofa—they are independent decisions.
2. **Dependent projects or Contingent projects**: In this case, the acceptance of one proposal is contingent upon the acceptance of other proposals. For example, construction of new building on account of installation of new plant and machinery is a case of dependent proposal. Here, new plant is dependent upon the new building for operational use.
3. **Mutually exclusive projects**: These are the projects wherein; the decision to invest in one project affects other projects because only one project can be purchased. For example, if in the very first example you decided you were going to buy only one automobile, but you were looking at two different types of bikes, one is a Hero and the other is a Suzuki. So, when you make the decision to buy the Hero, you have also decided you are not going to buy the Suzuki.

An *independent project* is one whose cash flows are not dependent upon the acceptance/rejection of other projects. Therefore, all independent projects which meet the capital budgeting criterion are accepted. In case of *mutually exclusive projects,* only one is selected.

CAPITAL PROJECT EVALUATION METHODS

Following are the most widely used methods for evaluating the capital investment projects:

1. **Payback period**: It focuses on the recovery of initial investment in the shortest time period. The limitation of this method is that it does

not consider cash flows after the payback period. Also, it does not consider the time value of money.

2. **Discounted payback period**: It overcomes the limitations of a payback period method which ignores time value of money. Discounted payback is the time period required by the cumulative discounted cash flows to recover the initial investment. Simply put, it is the length of time for the project to reach NPV = 0.
3. **Accounting rate of return (ARR)**: It uses accounting income basis for calculating the average return from a project. Here, the projected return is compared to a target ARR based on the firm's cost of capital for arriving at a decision.
4. **Net present value (NPV)**: It is based on the time value of money and is a popular DCF method. It discounts future cash flows (both in- and out-flows) using a target cost of capital and looks at the difference between the present value of net cash inflows and cash outflows. A positive value implies that the project is profitable and that the firm recovered its cost of capital and vice versa.
5. **Profitability index (PI)**: It is a ratio of the present value of inflows to the present value of outflows. The index is used instead of NPV in case of evaluating mutually exclusive proposals that have different costs.
6. **Internal rate of return (IRR)**: It is also a DCF method. It finds out the discounting rate that equates the present value of cash outflows and cash inflows. This rate of return is then compared to the required rate of return to determine the viability of the capital project.
7. **Modified internal rate of return (MIRR)**: It tries to improve the performance of the IRR. It overcomes the deficiencies in the IRR method. The rate for investing the cash inflows in the project can be chosen by the individual. For example, if the analyst chooses to use the hurdle rate for reinvestment purposes, the MIRR technique calculates the present value of the cash outflows, the future value of the cash inflows (to the end of the project's life), and then solves for the discount rate that will equate the present value of cash outflows and the future value of the benefits.

NPV vs. IRR

NPV is considered to be better than IRR for following reasons:

Reinvestment of cash flows: The NPV method assumes that the project's cash inflows are reinvested to earn the discounting rate; whereas the IRR assumes that the cash inflows are reinvested to earn the IRR. The NPV's assumption is more realistic in most situations because discounting rate is the financing cost whose recovery is the main criterion. IRR recovery is more of an interpolation.

Multiple IRRs: It is possible to have multiple IRRs for the same project. If the cash flows are nonconventional (e.g., positive cash flow in one year, negative in the next), the IRR method will have more than one solution. The NPV method does not have this problem.

Evaluating Risk of Capital Projects

Risk is an inherent element of any project and therefore needs to be analyzed carefully. The most commonly used risk-assessment techniques include Margin of safety, Sensitivity analysis, Scenario analysis, Decision-tree analysis, and Monte Carlo simulation.

1. **Margin of safety**: It indicates the cushion cover in business during uncertain periods.
2. **Sensitivity analysis**: It analyzes the effect of a key variable on the project' profitability under given conditions. It is also called as 'what if analysis'?
3. **Scenario analysis**: It finds out the impact of a given scenario on a project based on various considerations. There are three scenarios which are used, optimistic, pessimistic, and most likely.
4. **Monte Carlo simulation**: It uses econometric/statistical probability analyses to calculate risk.
5. **Decision-tree analysis**: It is a graphical representation of potential scenarios and calculates each scenario's expected profitability based on the project's cash flow.

CHAPTER 3

Project Feasibility

The Present Chapter

It explains the concept and process of project feasibility as used in case of multiple and high-funded business projects.

Introduction

Before deciding on any business venture involving huge risk and investment, its' essential to find out whether the project is feasible or not, that is, conduct a **feasibility study**. *The feasibility study can be conducted for smaller projects as well, but generally on account of time and efforts involved, it is conducted for bigger projects.* This process helps to determine the implementation of the project on time and under budget. A feasibility study needs to be completed as early in the project life cycle as possible. The best time to complete it is when you have identified a range of different alternative solutions and you need to know which solution is the most feasible to implement.

Feasibility Study

A feasibility study is an analysis of the viability of an idea. It helps to answer the question of "should we proceed with the proposed project?" *Project feasibility and project appraisal are often used interchangeably* and referred to "project assessment." Project feasibility is concerned with assessing, in advance, whether a project is worthwhile and therefore if it should be proceeded with.

Feasibility studies can be used for diverse needs but they primarily focus on proposed business ventures. It's better to conduct a feasibility study in such a case to determine the viability of the business idea before proceeding with the development of a business. Determining early an unviable business idea will not only save time, but money as well.

A feasible business venture is one where the business will generate adequate cash flow and profits, withstand the risks it will encounter, remain viable in the long-term and meet the predetermined goals. The venture can be a start-up business, the purchase of an existing business, an expansion of current business operations, or diversification of an existing business.

Prefeasibility Study

A prefeasibility study may be conducted first to sort out the relevant scenarios. Before proceeding with the final feasibility study, a prefeasibility analysis should be conducted as a "pilot survey." This will help to proceed with the business development with more ease and confidence.

Process of Feasibility Study

Feasibility studies can assume different forms, depending on their contexts. In large enterprises, a feasibility study could take months or even years of work. On the other hand, a small business with the right direction and resources can perform a feasibility study within a few days. Following are the steps to determine project feasibility:

Step 1: Identify the Business Drivers

In every business idea, there is an inherent problem involved, either low productivity, or inefficiency of resources, or tapping growth opportunities. The project is driven by a business problem. These problems are called "business drivers" and they need to be clearly identified, as part of your feasibility study. Their importance to the business, their critical factor, and their impact on the business are crucial for the proposed project.

For instance, the business driver could be that an IT system is outdated and is not able to maintain proper MIS, or that two business units need to come together for better results. As per the business driver, you need to have an in-depth analysis of it in order to fully understand the rationale of the project decision.

Step 2: Determine the Alternative Solutions

Based on the business problem, the alternative solutions available to a project need to be determined. If it's an IT system that is outdated, then your alternative solutions might include redeveloping the existing system, or replacing it with another system. Once, the alternative solutions to the business problem are identified, the feasibility study is conducted.
It involves twofold processes:

- Eliminate scenarios that are not sound.
- Tap the scenario(s) that have potential for further exploration.

Step 3: Conduct the Feasibility

At this stage, the feasibility of each project solution is conducted. The relevant question here is "will the project deliver it on time and under budget?" For this, various financial and nonfinancial methods are used to assess the feasibility of each solution. This is being discussed in detail in the next section.

Step 4: Selection of the Most Suitable Choice

After the feasibility study of each alternative, the next step is to select the most suitable project solution. The most feasible project will have the lowest risk, and the highest return.

Step 5: Implement the Project

It's now time to implement the project selected above. The management decides on:

- Developing a business plan and proceeding further.
- Identifying additional scenarios for further study.
- Following follow-up action.

But, if none of the solutions is found to be suitable then the above step is replaced by repeating the entire process to find out another suitable solution, or the project is scraped completely, if found unviable.

Types of Project Feasibility

These are discussed below:

I Market Assessment

Market feasibility is conducted to determine the viability of a proposed product in the marketplace. The market assessment only helps in identifying the business opportunities for the product. If no opportunities are found, it is not worthwhile to proceed further. If opportunities are found, the market assessment provides direction to the business for the necessary investigation.

Industry focus

- Describe the nature of the industry, market and/or market segment(s) with respect to its stability.
- Describe the size and scope of the industry, market and/or market segment(s).
- Identify the life cycle of the industry, market and/or market segment(s). Is it new, growing, mature, or declining?
- Estimate the future prospects of the industry, market and/or market segment(s).

Industry competitiveness

- Describe the industry concentration regarding the number and types of producers.
- Describe the major competitors? Decide your strategy to face the competition.
- Analyze the barriers to entry of new competitors into the market or industry.
- Analyze the concentration and competitiveness of input suppliers and product/service buyers.
- Describe the price competitiveness of your product/service.

Market potential

- Identify the selling place for your product, that is, whether the product will be sold into a commodity market or a differentiated product/service market.
- Identify the demand size of the market or market segment for the product.
- Assess the potential share of the market or market segment for your product.
- Identify the potential buyers of the product/service and the associated marketing costs.
- Investigate the product/service distribution system and the costs involved.

Sales projection

- Estimate sales.
- Identify the probable challenges in meeting your sales targets.
- Plan out the necessary strategies to overcome the above challenges under given constraints.

II Technical Feasibility

It identifies the technical requirements of the proposed project. The technical requirements are then compared to the technical capability of the organization to find out whether the organization has the necessary technical know-how to undertake the project or not? The project is technically feasible if the internal technical expertise is sufficient for the project requirements.

The analyst should also explore the need for up gradation/ addition of technical resources to fulfill the project under consideration.

Technology requirements

- Estimate the size and type of production facilities.
- Investigate the need for resources, like buildings, equipment, man power, and so on.
- Determine the type of technology needed.
- Find out and compare the technology providers.

- Determine reliability and competitiveness of technology for state-of-the-art, and so on.
- Identify the constraints of the technology.

Availability of resources

- Determine the requirement for raw materials, transportation, labor, and other production inputs (electricity, water, and so on.)
- Investigate the current and future availability and access to raw materials.
- Assess the quality and cost of raw materials.
- Investigate the availability of labor including wage rates, skill levels, and so on.
- Assess the potential to access and attract qualified management personnel.
- Analyze environmental impacts.
- Identify regulatory requirements.
- Explore economic development incentives.

III Financial/Economic Feasibility

The financial feasibility is the most important part of any feasibility study as this determines the return potential of the project.

A financial analysis looks at a project from the point of view of the operating costs and revenues. He must consider indirect economic benefits of a project, such as transport cost savings and reductions in wastage and deterioration of the product. This gives an estimate of the project's benefits to the whole economy.

(Generally, both financial and economic feasibility of the project is done combined, though economic feasibility can be conducted separately as well).

Economic analysis requires a number of adjustments to the financial cash flow. Depreciation should be omitted as well as land acquisition and taxes, as these are both transfer payments. Shadow pricing of labor, if included in the financial analysis, should be omitted. The costs of management training and other forms of government or donor assistance, if provided, should be added to the cash flow.

Estimating the net economic benefits of projects is generally difficult, particularly in developing countries as many of the benefits are unquantifiable. Therefore, in the financial analysis, it is advisable to examine the returns critically by applying a sensitivity analysis.

Estimate the total capital requirements

- Assess the need for "seed capital" for the business start-up.
- Estimate capital requirements for facilities, equipment, and inventories.
- Estimate working capital needs.
- Estimate start-up capital needs until revenues are realized at full capacity.
- Estimate contingency reserve needs due to time over runs, construction delays, technology issues, market delays, and so on.
- Estimate other capital needs.

Estimate equity and credit needs

- Estimate equity needs.
- Identify alternative equity sources and capital availability—family, investors, venture capitalists, and so on.
- Estimate credit needs.
- Identify and assess alternative credit sources—banks, government (i.e., direct loans or loan guarantees), grants and local and state economic development incentives.

Expected costs and returns

- Estimate the expected revenue, costs, profit margin, and expected net profit.
- Estimate the sales or usage needed to breakeven.
- Estimate the returns under various production, price and sales levels, test by applying scenario analysis and/or a Monte Carlo simulation.
- Benchmark against industry averages and/or competitors (cost, margin, profits, ROI, and so on.).
- Identify limitations or constraints of the economic viability.

- Calculate expected cash flows during the start-up period and when the business reaches capacity.
- Prepare pro forma income statement, balance sheet, and other statements of when the business is fully operating.

IV Organizational/Managerial Feasibility

The managerial capability to undertake the project is another important aspect of the project selection. Even if the project is found to be technically, economically, and financially feasible it can still fail if the people who implement or manage it are not capable. It is important that there should be an efficient management for the proposed project. The success and the profitability of the project largely depend on managerial competence and that's why the lending institution gives special importance to this area of feasibility study.

Operational feasibility is a measure of how well a proposed system solves the problems, and takes advantage of the available opportunities for the project.

Business structure

- Identify the proposed legal structure of the business.
- Outline the staffing framework of the business along with lines of authority and decision-making structure.
- Identify the important stakeholders.
- Identify the availability of skilled and experienced business managers.
- Identify the availability of necessary service providers on the project, including legal, accounting, and other experts.

Business promoters

- Character is the key—are the people involved of outstanding character?
- Do the founders have the "fire in the belly" required to take the project to completion?
- Do the founders have the skills and ability to complete the project?
- Who are the key individuals leading the project?

- Is there a reward system for the founders? Is it based on business performance?
- Have the founders organized other successful businesses

Feasibility Study Vs. Business Plan

A feasibility study is not a business plan. It is an investigating function which addresses the question of "Is this a viable business venture?" The business plan provides a planning function and outlines the actions needed to take the proposal from "idea" to "reality."

The *feasibility study* proposes and analyzes several alternatives or methods of achieving business success and finally narrows down on the best business scenario. This becomes the basis for the business plan. The **business plan** deals with only one alternative or scenario.

The *feasibility study* is conducted before the business plan. A *business plan* is prepared only after the business venture has been deemed to be feasible to provide a "roadmap" of how the business will be created and developed. The business plan provides the "blueprint" for project implementation.

Essentials of a Good Feasibility Study

Following are the key elements of an effective feasibility study:

1. **The Scope of the project**: It defines the business problem and/or opportunity to be addressed. The scope should be well defined and clear. A well-defined problem is easier to proceed with. It should not be vague and confusing to the project participants.
2. **The Analysis**: Proper understanding of the method of implementation of the project is crucial to its success. The strengths and weaknesses of the current approach should be identified for saving time and money.
3. **Requirements**: Requirements of the project should be well defined as per the object of the project. For example, the requirements for a construction project will be different than requirements for an IT project.

4. **The Approach**: This represents the course of action to be followed to undertake the project. Possible alternatives should be considered along with an explanation as to why the preferred solution was selected. At this point, the use of existing structures and commercial alternatives are considered (e.g., "make versus buy" decisions). A thorough analysis here is needed in order to perform the next step.
5. **Cost evaluation**: This involves the examining of the cost effectiveness of the approach selected with a comparison of other alternatives. An estimate of labor and out-of-pocket expenses is assembled along with a project schedule showing the project path and start-and-end dates. After the total cost of the project has been calculated, an evaluation summary is prepared including cost/benefit analysis and return on investment, and so on.
6. **Review**: A formal review is conducted of the above feasibility study with all parties involved. The review serves two purposes: to check the accuracy of the study, and to make a project decision; either approve it, reject it, or ask for the revision before making a final decision. If approved, it is very important that all parties sign the document as a part of their acceptance. If the feasibility study is rejected, the reasons for its rejection should be explained and attached to the document.

Importance of Project Feasibility

Project appraisal helps in getting the following benefits:

I Launching a New Business

Many entrepreneurs launch a new business that can get them to a sustainable profit level but they fail. A proper feasibility study avoids this failure. It not only determines the long-term viability of the business, but also helps in understanding the resources necessary for a successful launch. During the "dot com bubble" in the late 1990s, many companies overlooked the importance of feasibility studies, going off without a trace.

II Utilization of Resources

Appraisal asks fundamental questions about whether funding is required and whether a project offers good value for money. It ensures that the resources are being utilized properly and for the use they are meant.

III Decision-Making Tool

Appraisal involves the comprehensive analysis of the complete range of data and factors, thereby facilitates a scientific decision making about the project. It considers the information, like:

- What type of organizational structure will help in achieving its objectives?
- What is the area deliverable?
- Are local people involved and the needs of people from all the groups considered?
- What is the sustainability factor?
- How risk will be managed?

IV Foundation for Delivery

Appraisal helps ensure that projects will be properly managed, by ensuring appropriate financial and monitoring systems are in place, there are contingency plans to deal with risks and setting benchmarks for performance review.

V Getting the System Right

The process of project development, appraisal, and delivery is complex and project feasibility ensures proper system to suit local circumstances and organization. Good appraisal systems should ensure that:

- Project application, appraisal, and approval functions are separate;
- All the necessary information is gathered for appraisal;
- Those involved in appraisal have appropriate information and training and make appropriate use of technical and other expertise.

Key Issues in Appraising Projects

Key issues in appraising projects include the following:

I Need, Target, and Objectives

The applicants should provide a detailed description of the project, identifying the local need it aims to meet. The project should be in the right response, and highlight what the project is supposed to do and for whom.

II Context

Appraisal should help show that a project is consistent with the objectives of the relevant funding and with the aims of the management. Conflicting issues, if any, with other projects should be avoided.

III Consultation

Local consultation may help determine priorities and secure community consent and ownership. More targeted consultation, with potential project users, may help ensure that project plans are viable.

- Alternatives/Options

Options analysis is concerned with establishing whether there are different ways of achieving objectives. This is a particularly complex part of project appraisal, but vital to review for meeting local need and key objectives.

IV Inputs

It's important to ensure that all the necessary people and resources are in place to deliver the project. Appraisal should include the examination of appropriately detailed budgets.

V Outputs and Outcomes

Detailed consideration must be given in appraisal to what a project does and achieves: its outputs and more importantly its longer-term outcomes.

Benefits to society in the form of jobs, better housing, safety, health, and so on should also be given weightage along with the produced outputs of the project.

VI Value for Money

This is one of the key criteria against which projects are appraised. A major concern for management is the return against costs.

VII Implementation

Appraisal will need to scrutinize the practical plans for delivering the project, whether staffing will be adequate, the timetable for the work is a realistic one and if the organization is capable of doing so.

VIII Risk and Uncertainty

You can't avoid risk—but you need to make sure you identify risk. So, ask:

i. Is there a risk and if so what is it?
ii. Estimate the scale of risk, and
iii. Evaluate the risk.

There should also be contingency plans in place to minimize the risk of project failure.

IX Sustainability

The project should be sustainable. The appraisal should include an assessment of a project's environmental, social, and economic impact, its positive and negative effects.

X Forward Approach

The appraisal of forward strategies helps how projects will develop. It involves thinking about whether a project should have a fixed life span or, if

it is to continue beyond a period of regeneration funding, what support it will need to do so.

While appraisal will focus detailed attention on each of these areas, none of them can be considered in isolation. All are interrelated—for example, a realistic assessment of outputs is essential to a calculation of value for money. So, the final judgment must depend on a balanced consideration of all these important factors.

CHAPTER 4

Project Management Techniques

The Present Chapter

It explains the various techniques to project management and control.

Introduction

Project management and control is a challenging task with many complex responsibilities. There are many tools which are applied to assist the effectiveness of a project delivery, ranging from IT oriented to non-IT based. There is no one tool that addresses all project management needs. Therefore, selection of a project management tool is to be done that best suits the management style.

Techniques of Managing Projects

The techniques used in managing a project are all interlinked, viz. Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis, Problem tree, and Logical framework analysis are all built into the development of the project cycle. This includes the setting of project objectives to meet the problem at hand and the establishment of an analytical framework. Other techniques that may be used in project identification and preparation include methods that are used in operational research. They include program evaluation and review technique (PERT) analysis and critical path analysis (CPA) and other optimization techniques.

1. Strengths, Weaknesses, Opportunities, and Threats

SWOT analysis is a very basic evaluation tool. It is the analysis of an organization's strengths and weaknesses and the opportunities and threats faced by it. Strengths and weaknesses indicate the internal characteristics of an organization, opportunities and threats are directed more toward the external environment, that is, financial, economic, and political environment. SWOT analysis may be used at any point within the project cycle. SWOT analysis is often used for knowing competitive position in the industry/market.

Example

An international manufacturer of clothing line is considering investing in a clothing draping machine in India. The manufacturer will explore the strengths and weaknesses of this plant compared to existing and potential producers in the country, as well as competition from existing products.

The manufacturer will look at a number of factors before deciding to invest in the plant. This will include current production within the country, the pricing policy for cloth, government intervention and, of course, estimated current and projected demand for readymade garments. Other issues will include the internal production costs and market price for cloth, and so on.

A SWOT analysis by the manufacturer will play an important role in the overall project evaluation.

SWOT analysis is useful for both public sector and public private sector investment projects. It is carried out early in project development to assess how a project should use its strengths of resource base, skills, employee commitment and deal with its weaknesses of low finance, new in the industry, and so on.

In the medium to long-term phase, project planners need to take into account opportunities (market opportunities such as the demand for product) and threats (competition from other off shore in the same sector or competition from other players within the same country, technological change, and so on).

2. Problem Tree Analysis

Problem tree analysis is very useful in the first stage in the development of a project. It is a method of identifying the problems, laying down

their interconnectedness and predicting how a project will address those problems. The main aim is to establish the cause–and–effect relationships between problems that exist. It involves three main steps

a. precise definition of the framework and subject for analysis,
b. identification of the major problems faced by target groups and beneficiaries, and
c. drawing a graphical representation of the problems and their contributory factors in the form of a diagram or problem tree.

3. Stakeholder Analysis

Stakeholders include everybody who has an interest in the project and who gets affected by the project and/or can influence the success or failure of that project. It is becoming increasingly important for project planners and analysts involved in project design to undertake a **stakeholder analysis**. It allows them to align the project objectives with the stakeholders' interests as they have a direct and indirect impact on the outcome of a project.
It includes the following steps:

(a) Identify the key stakeholders: Differentiate between primary and secondary stakeholders with regard to the degree of impact on the project. Generally, key stakeholders refer to those stakeholder groups who can influence a project significantly or who are important for the objectives of the project to be met.

(b) Assess the stakeholders' interests: Analyze the potential impact of the project on the stakeholders' interests and align them with the project deliverables for future viability.

4. Logical Framework Analysis (LFA)

Logical framework analysis or logframe analysis (LFA) is a methodology for establishing a framework for the evaluation of projects. It plans, manages, and evaluates projects. It involves stakeholder analysis; problem analysis; analysis of project objectives; analysis of strategies; preparation of the logframe matrix; and activity and resource schedules.

The logframe is the matrix in which the project's rationale, the underlying assumptions, objectives, indicators, and sources are presented.

5. *Program Evaluation and Review Technique*

An important component of network analysis is **program evaluation and review technique** (PERT).

PERT is a planning and control tool used for defining and controlling the tasks necessary to complete a project. PERT planning involves the following steps:

i. *Identify the specific activities and milestones*: The activities are the tasks of the project. The milestones are the events that define the beginning and the end of one or more activities.
ii. *Determine the sequence of activities*: This step is required for those activities which do not have an explicit activity sequence. They require some analysis to determine the exact order of performance. In case of the tasks whose activity sequence is evident, this step may be combined with the step above.
iii. *Construct a network diagram*: Using the activity sequence information, a network diagram can be drawn showing the sequence of the successive and parallel activities.
iv. *Estimate the time required for each activity*: Weeks are a commonly used unit of time for activity completion, but any consistent unit of time can be used.

PERT uses three time estimates for each activity:

i. *Optimistic time*: the shortest time in which the activity can be completed.
ii. *Most likely time*: the completion time with the highest probability.
iii. *Pessimistic time*: the longest time an activity takes.

6. *Critical Path Analysis*

Critical path analysis (CPA) is an organized technique to planning, scheduling, and controlling practical situations where many separate jobs, in a given task, can happen simultaneously or in sequence. It helps to establish the relationship between the separate jobs or project components. CPA identifies three phases:

- *Planning phase:* here the objective of the project are determined and the project tasks are arranged into an order of

precedence. Some tasks will be carried out in parallel, others in series.

- *Scheduling phase*: this converts the plan into a feasible and readily implemented schedule, with reference to the optimum use of available resources, including physical and monetary.
- *Control phase*: this involves the monitoring of actual progress and taking of corrective actions to ensure adherence to the schedule.

The critical path is determined by adding the times for the activities in each sequence and determining the longest path in the project. The critical path determines the total calendar time required for the project. The amount of time that a noncritical path activity can be delayed without delaying the project is referred to as "slack time."

PERT vs. CPM

PERT charts and Critical path method (CPM) charts are often used interchangeably; the only difference is in the computation of task times. Both charts display the total project with all scheduled tasks shown in sequence. A graphic representation called a "Project Network" or "CPM Diagram" is used to portray graphically the interrelationships of the elements of a project and to show the order in which the activities must be performed.

PERT analysis differs from CPA in that it allows for uncertainty by building into the project scheduling time constraints for each activity, including: quickest reasonable time; most likely time; and worst time.

CHAPTER 5

Social-Costs Benefit Analysis

The Present Chapter
It explains the social-costs benefit approach to project appraisal.

Introduction

The techniques of financial and economic analysis and impact assessment are becoming increasingly important for project evaluation, especially for choosing between projects where resources, both financial and human, are limited. The use of recognized assessment techniques for project proposals has become mandatory as part of the selection process for projects funded by the international financial institutions such as the World Bank, the International Finance Corporation, Asian Development Bank, and others. However, while financial and economic issues are relevant for projects, policy makers and financial institutions are increasingly concerned with social issues—including the cost and welfare impacts of projects.

Social-Costs Benefit Analysis

Social-costs benefit analysis (SCBA) is an integral part of project appraisal. The social appraisal is undertaken as part of project design. It may rely primarily on upstream analytical work or may require a social assessment during the process.

Social analysis during project preparation and appraisal focuses on the opportunities and constraints, and the likely outcomes, impacts and risks of a project. It evaluates the social benefits and outcomes of the project and determines whether the investment opportunities recover the social costs. It assesses the social impact of the project and provides inputs to feasibility studies and design.

The social analysis does not end with project appraisal. It measures the social dimensions of the project at various intervals during the project cycle. During the *identification stage*, it identifies social issues relevant to the sector; assesses the adequacy of available information on those issues; identifies the stakeholders; and finally decides whether the firm should undertake a social assessment. During the *design stage*, it involves the assessment of the quality of social analysis, and the anticipation of social constraints that might arise during implementation, monitoring, and supervision.

Social analysis is not just an analytical method. Its real value lies in its contribution to project design and development impact. Despite this, project planners often ignore the importance of social analysis as an operational tool.

Approaches

1. UNIDO Approach

The UNIDO approach of project appraisal examines the desirability of a project on following parameters:
(a) financial viability
(b) cost and savings

These aspects are examined in five stages of the social benefit-cost approach of the project.

Stage one
It measures financial profitability using standard analytical tables, enumerating various costs and benefits at the market price, and examines profit viability from investors' point of view.

Stage two

It adjusts the financial costs and benefits for various market imperfections by valuing costs and benefits or net benefits in terms of economic efficiency.

Stage three

This stage examines the impact of projects on savings and expense to make a choice of alternative investments in labor-intensive and capital-intensive projects. In case of capital-scarce countries, saving is assigned great importance, so this stage recommends the rate for adjustment for savings by which the social value of a rupee/dollar investment exceeds its expenditure value.

Stage four

This is important for those countries that regard income redistribution in favor of weaker sections and backward regions as desirable objectives.

Stage five

Finally, in stage five, the UNIDO analysis suggests a methodology for necessary adjustment of the deviations in economic and social values and difference between the efficiency and social value of project output, for example, between good and bad or merit and demerit goods.

2. Little-Mirrlees Approach

Its mathematical formulation is identical to the UNIDO method except for differences in assigning value to discount rates and accounting for imperfections and other market failures and social considerations.

Like UNIDO guidelines, the Little-Mirrlees method also suggests valuation of project investment at opportunity cost (shadow prices) of resources for necessary corrections due to market imperfections.

Little and Mirrlees have also suggested an elaborate methodology for calculating shadow prices of nontradables. The belief here is that in all less developed countries, one of the major criteria for the choice of a project should be its ability to generate savings and, hence, the Little-Mirrlees method suggests the use of "accounting rate of interests" to calculate present worth of future annuities of savings and consumption.

Unlike the five stages of UNIDO, the Little and Mirrlees procedure is relatively more practical.

Case Study

"Building a toilet for girls at the only school in a village of Haryana State, India"

Data of the Proposed Project

1. Name: Toilet for girls in a village of State of Haryana.
2. Location: Haryana, India
3. Proposed goal: Increasing the attendance of girls students in school and better sanitary conditions in the school and nearby area in the village suffering from shortage of toilets.
4. Project execution: School authority, parent associations, civil society, and Haryana corporation authorities.
5. Financing: School authorities, District council, Ministry of Education and possibly a donor and international NGOs.

Project Description

According to the recent report of one of the self-help group, shortage of toilets for girls students has hit their attendance in schools in the district. It is highlighted by the Ministry of Education also. This reveals that there is urgent need for at least one toilet for girls students in every school in the village.

The proposed project is therefore to initially build one toilet of 20 ft deep, 5 ft wide, and 10 ft long with a door and a window at the schools in the village.

Project Justification

This will immediately improve the attendance of girls students in the school, result in better sanitary conditions at the school, reduce the incidence of terminal sickness, and make the enhance learning environment better.

Project Risks

- lack of space,
- shortage of funds,
- lack of appropriate building skills,
- bureaucratic bottleneck, and
- interferences from local politicians.

These aspects are presented in a project analysis matrix to highlight the main features and their linkages. Following is the project matrix for the project under consideration.

Table 5.1 Proposed Project Analysis Matrix

Summary	Indicators	Means of Verification	Key Assumptions
1. Goal Improvement of attendance of girls students and better sanitary conditions and elimination of total disease in the Schools of the village.	Provision of minimum one toilet for only 20 girls students	Progress report by: School authorities Parent association District council	Availability of space Availability of funds Education policy compliance
2. Purpose Construction of one toilet at the only school in the village	Dimensions of 5 ft wide, 10 ft long, and 20 ft deep with a lockable door and window	Progress and status report	Funds Building skills Local politics External support
3. Output Completion of one toilet	One toilet with a lockable door and window	Completion report	Contractual terms and timing
4. Activities • Hiring builders • Procurement of materials • Training local staff	• Funds available • Space allocated • Materials purchased	Completion report	Timely follow-up School authorities District council
5. Financing • School • Contributions • District • Others	Funds available	Progress report	Willingness to support the project
6. Completion	One toilet	Completion report	Official report

Feasibility Study

During the process of project appraisal, a feasibility study may be undertaken to establish the justification of the identified project, including its technical, economic and financial viability, and social acceptability; as well as its conformity with the national objectives and the relevant policy, legal and regulatory framework. The feasibility study identifies the following aspects:

i. Development objectives of the project
ii. Policy framework
iii. Technical soundness of the project
iv. Organizational feasibility of the project
v. The economic and financial viability of the project proposal
vi. Project beneficiaries
vii. Considerations of customs and traditions of the society
viii. Other important policy and cross cutting issues (gender, environment)

The results of a feasibility study influences decisions to go ahead with the given project proposal.

SECTION 3

Capital Budgeting Management

CHAPTER 6

Time Value of Money

The Present Chapter
It discusses the relevance of "time value of money" in capital budgeting decision.

INTRODUCTION

Every capital budgeting decision should satisfy the following criteria:

- Must consider all of the project's cash flows.
- Must consider the "Time Value of Money."

So, capital budgeting decisions would be unrealistic if the time value of money is not duly incorporated in the capital investment analysis.

What Is Time Value of Money?

Time value of money describes the relationship between the value of rupee today and value of rupee in future. It refers to the purchasing power of money exercised by an individual with the changing times. Thus, Re 1 received today is considered to be much more valuable than a rupee received tomorrow.

Money has a time preference on account of following key factors:

i. Risk/Uncertainty
ii. Preference for Consumption
iii. Investment opportunities

Methods of Valuation

There are two methods of accounting for time value of money, (a) Compounding, and (b) Discounting. **Compounding** refers to the future value of a present sum of money. **Discounting** denotes the present value of a future sum of money.

A. *Compounding—Future Value (FV)*

(a) Future Value of a Sum of Rupee

$$FV(A) = P \times (1 + r)^n$$

Here, P = Sum invested today
r = Interest rate

Example: Mr. A decides to invest Rs. 1,000 in a deposit account at an annual interest rate of 8%. What is the compounded value after 3 years?

Solution:

$$A(FV) = P(1 + r)^n$$

So, $A = 1{,}000(1 + .08)^3 = \text{Rs. } 1{,}259.70$

Using, compounded value of Re 1 tables, we get the compound value of Re 1 at 8% p.a. at the end of 3 years as 1.2597.

Hence, the compound value of Rs. 1,000 will be:

$$\text{Rs. } 1{,}000 \times 1.2597 = \text{Rs. } 1{,}259.70$$

(b) Future Value of an Annuity Series of Cash Flows

If same amount is invested every year, it is termed as "Annuity."

$$A(FV) = P\left[\frac{(1+r)^n}{r} - 1\right]$$

Here,

A = Future value of the annuity at the end of the period
r = Annual rate of interest
n = Number of years of annuity

Example: Mr. X wishes to buy a machine after 3 years. He plans to deposit Rs. 2,000 at the end of each year into a bank savings account paying a fixed rate of interest of 7 % for the same. What is its future value 3 years from now?

Solution:

$$A(FV) = P\left[\frac{(1+r)^n}{r} - 1\right]$$

$$A(FV) = 2{,}000\left[\frac{(1+.07)^3 - 1}{.07}\right]$$

So, A = Rs. 6,430

Using, compounded value annuity tables, we get the compound value of Re 1 at 7% p.a. at the end of 3 years as 3.215.

Hence, the compound value of an Annuity of Rs. 2,000 will be:

$$\text{Rs. } 2{,}000 \times 3.215 = \text{Rs. } 6{,}430$$

B. Discounting—Present Value (PV)

(a) PV of a Future Sum

$$PV(P) = \frac{A}{(1+r)^n}$$

Here, A = Sum received a year after

r = Interest rate

Example: Mr. Amit expects to get Rs. 1,000 after 3 years at the rate of 8%. Calculate the PV of future cash inflows.

Solution:

$$PV = \left[\frac{A}{(1+r)^n}\right]$$

So,

$$PV = \left[\frac{1{,}000}{(1+.08)^3}\right]$$

$$= \text{Rs. } 793.80$$

Using, PV tables, we get the PV of Re 1 at 8% p.a. at the end of 3 years as 0.7938.

Hence, the PV of Rs. 2,000 will be:

$$\text{Rs. } 1{,}000 \times 0.7938 = \text{Rs. } 793.80$$

(b) PV of an "Annuity"

$$PV = A \times \frac{1}{r}\left[1 - \frac{1}{(1+r)^n}\right]$$

Here, A = Installment at the end of each period

r = Rate of discount

n = Number of years for which annuity lasts

Example: Mr. Dreamer has won a litigation case and is expecting to receive Rs. 500 at the end of each year for the next 30 years. What is the PV of Rs. 500 due to be received at the 7% discount rate?

Solution:

$$PV = A \times \frac{1}{r}\left[1 - \frac{1}{(1+r)^n}\right]$$

Using, PV annuity tables, we get the PV of annuity of Re 1 at 7% p.a. at the end of 30 years as 12.409.

Hence, the PV of an Annuity of Rs. 500 will be:

$$\text{Rs. } 500 \times 12.409 = \text{Rs. } 6{,}204.50$$

So, solving the equation above and PV annuity tables, the present value comes out to be Rs. 6,204.50.

CHAPTER 7

Determination of Cash Flows

The Present Chapter

It explains how to determine the relevant cash flows for capital investment decisions.

Introduction

The stake-holders focus on two elements while investing in business: *first,* what are its investments plans, and *second,* how does business fund these investments. This involves determination of cash flows. Cash flows are the most important factor in a capital investment decision. Investment decision has to take place today, not in future and therefore capital expenditure is a cash-flow concept; rather than a profit-based concept. Correct computation of cash flow decides the success or failure of any investment decision. Thus, it is imperative to know the process of determination of cash flow for capital investment decisions.

Cash Flows

Cash flow can arise from a revenue or expense stream that changes a cash account over a given period. *Cash inflows* are expected to arise from the operating activities, whereas *cash outflows* result from investment activities. This holds true for all forms of business organizations. Therefore, cash inflows and outflows are considered as one of the most essential elements determining the continued existence of a business in future.

Success of any business can be determined through its capacity to generate positive cash flows.

Estimation of cash flows requires proper understanding of the project before it is implemented; particularly regarding the company and the economy. In this process, the life of the project plays a very important role; it can change the entire dimension of the project. So the project life has to be estimated with due care.

Cash Flow Estimation

Evaluating a capital budgeting project needs estimation of "after-tax cash flows," the asset is expected to generate in future. Estimating future cash flows is not an easy task because the future cannot be predicted with certainty. Some cash flows can be predicted more accurately than others. For example, the cash flows associated with a project that has existed for a long time period—a power plant—might be easier to forecast, while the cash flows associated with a project that is introduced recently—an event management company—might be difficult to predict. Accurate cash flows forecast is important because incorrect forecast could lead to the acceptance of an unprofitable project or rejection of profitable projects.

1. Cash Flow versus PAT

We should be concerned with cash flows rather than income because cash flows are necessary to undertake the investment and meeting operational expenses, not the accounting profit. Cash flows can be invested to earn positive returns; income cannot.

Always use cash flows after taxes, that is, "after-tax cash flows"—because cash is needed to pay taxes. The computation of accounting income often includes noncash items, such as depreciation.

Thus, in simple terms, the following relationship is used to estimate operating cash flows:

$$\text{Net cash flow} = \text{Net income} + \text{Depreciation}$$

2. Relevant Cash Flows

Cash flows evaluated in capital budgeting decisions should always be "relevant" cash flows. Relevant cash flows are determined keeping in view the following factors:

(a) Sunk Costs

If a cash outflow associated with the project has already occurred and will not be affected by the decision to purchase the asset, it is considered a "'**sunk cost**." For example, a firm might pay Rs. 200,000 for an evaluation study to determine whether a new project should be accepted. Rs. 200,000 will be paid whether the firm decides to accept the project or not, that is, it is incurred for conducting a feasibility analysis. Thus, the cost of the evaluation study is a sunk cost.

This cost should not be included in the capital budgeting analysis because it is not a relevant future cash flow associated with the decision of undertaking the project. So, we should only evaluate the cash flows that change in the future as a result of the capital budgeting decision.

(b) Transportation & Installation Costs

These costs generally are not included in the purchase price of an asset, but they are essential for the use of an asset because the firm cannot use the asset until it is received and put in operating condition. The depreciable cost of an asset always includes the purchase price plus all the necessary costs to make the asset operational, including transportation and installation.

(c) Inflation

Inflation factor should be incorporated into the forecasts of the future cash flows associated with a project; otherwise, the analysis could lead to incorrect results.

3. *Incremental Cash Flows*

Next important factor is that cash flows in capital budgeting should always be "incremental," cash flows associated with the asset. In other words, we should examine only those cash flows that are affected, or change, if the asset is purchased.

Incremental cash flows include both outflows and inflows. *Incremental* implies the "net benefit." Every investment involves a comparison of alternatives, that is, you always have at least two possibilities involved in a decision. See the following alternative cases:

Case 1: Replacement of an old machine

Case 2: Investment in Project A or in Project B

Case 3: Investment in a Project (To invest or not to invest)

So, cash flows to be considered for capital investment should be incremental cash flows. When examining incremental cash flows following variable must be kept in mind:

Opportunity cost

Opportunity cost is the return that can be earned by investing funds in assets similar to those which are owned by the firm, that is, the next best return sacrificed if the funds are not invested in the proposed capital budgeting project. For example, if a company owns an empty office with a market value of Rs. 2 million and they are considering using the office space for the firm; Rs. 2 million is considered an opportunity cost associated with the decision to use the office building for the business.

Types of Incremental Cash Flows

There are three types of incremental cash flows:

(i) Initial investment outlay: It is the cost of an asset and includes cash flows that occur only at the beginning of the project's life. Cash flows included in this category are the purchase price of the asset, shipping and installation costs, the cash flows associated with disposal of the old asset if

that asset is being replaced, taxes, changes in net working capital, and any other up-front cost associated with a capital budgeting project.

The item, "changes in net working capital" refers to the change or affect in inventory or other item of working capital when a new machine is purchased and added to the firm or when an old machine is replaced by a new machine. In some cases inventory will increase, which means there will be an additional cash outflow associated with purchasing the additional inventory, and in other cases inventory will decrease, which means there will be a cash inflow associated with purchasing the asset because inventory can be sold until the new, lower level of inventory is achieved.

How to calculate cash outflows?

Initial Investment Outlay/Initial cash outflow
Cost of new asset(s)/project(s)

+ Capitalized expenditures

(e. g., installation costs, transportation, shipping expenses, and so on.)

+(−)Increase/Decrease in working capital

−Net proceeds from the sale of old asset

+(−)Increase in Taxes/Tax savings due to sale of old asset

(if the investment is a replacement decision)

=Initial cash outflow

(ii) Incremental operating cash flows: These are the return cash flows that result out of the use of the asset during its life. One item that must be included in incremental cash inflows is the effect of taxes—if revenues and expenses change, then the tax liability of the firm also changes. The effect of taxes has been discussed below.

In most cases, incremental operating cash flows can be computed using the following equation:

Incremental operating cash flow t = Δ Cash revenues t − Δ Cash expenses t − Δ Taxes t = Δ NIt − Δ Taxes t

where Δ represents a change, Δ NIt is the change in net income associated with the project.

Calculation of cash inflows

Cash Inflows over a Project's Life

PAT

+ Depreciation

(Noncash charges)

+ Interest after tax

(Nonoperating items)

= Annual cash inflows

Note: Cash inflows are "Operating cash flows after tax"

(iii) Terminal cash flows: These are the cash flows that occur only at the end of the life of the asset. They are the salvage value of the asset.

4. *Terminal Cash Inflows*

Annual cash inflow

+ Working capital released
+ Scrap value of the plant (if any).

Key points for calculation of cash flow

- Incremental cash flows
- Relevant cash flows
- Ignore sunk cost
- Ignore any other irrelevant cost

5. ***Components of Cash Flows***

1. Initial investment/Initial cash outflow
2. Annual cash inflows from investments
3. Terminal cash flows
   (Salvage value)

Exercise: Replacement of an old machine

A firm wants to replace old machine, which is capable of generating cash flows of Rs. 3,000, Rs. 2,000 and Rs. 1,000 during the next 3 years. It has a book value of Rs. 10,000 and a market value of Rs. 5,000. The firm is considering buying a new machine, which will require an initial cash outlay of Rs. 15,000, and is estimated to generate cash flows of Rs. 10,000, Rs. 8,000, and Rs. 5,000 for the next 3 years. Both old and new equipment have a zero resale value after 3 years. Taxes do not exist.

Determine the incremental or additional cash flows which will occur if the old machine is replaced.

Solution:

Cash Flows (Rs.)

Year	0	1	2	3
Cash flows of new equipment	−15,000	10,000	8,000	5,000
Less: Cash flows of old equipment	5,000	3,000	2,000	1,000
Incremental cash flows (New − Old)	−10,000	7000	6000	4,000

It is evident here that by spending Rs. 10,000 of incremental cash outflows, one gets Rs. 17,000 of incremental cash inflows. The time value of money is not applied here.

Also, book value of Rs. 10,000 of the old machine is not considered as it is not relevant here.

It is "Sunk cost."

Tax Effect Example

A company purchased a plant a few years back for Rs. 20,000. It wants to replace this by a new one costing Rs. 25,000. The company is subject to income tax @ 50%. The present book value of the machine is Rs. 10,000.

Calculate the net initial cash outflow if the company decides to purchase the new machine, and the old machine is sold for:

Rs. 10,000
Rs. 12,000
Rs. 8,000

Solution:

Book value of machine = Rs. 10,000

	Rs.
(a) Cash required to purchase the new machine	25,000
Less: Cash realized from the sale of old machine	10,000
Net Cash outflow	15,000
(b) Cash required to purchase the new machine	25,000
Less: Cash realized from the sale of old machine	12,000
	13,000
Add: Income tax liability on profit of sale of machine (2,000 × 50 / 100)	1,000
Net Cash outflow	14,000
(c) Cash required to purchase the new machine	25,000
Less: Cash realized from the sale of old machine	8,000
	17,000
Less: Saving in tax liability due to loss on sale of old machine (2,000 × 50 / 100)	1,000
Net Cash Outflow	16,000

Exercise: A&B Ltd. (Replacement Decision)

A&B Ltd. plans to replace an old machine with new machine.

From the following information, determine the net cash required for such replacement:

Cost of the old machine	Rs.80,000
Life of the old machine	5 years
Cost of the new machine	Rs.1,00,000
Shipping charges	Rs. 10,000
Amount realized on sale of old machine	Rs. 20,000
Additional resources required	Rs. 2,000

Income tax 50%

Depreciation is charged as per SLM and remaining life is 1 year.

Solution:

	Rs.
Cost of the new machine	1,00,000
Add: Shipping charges	10,000
Additional working capital required	2,000
Additional income tax liability (4,000 × 50 / 100)*	2,000
	1,14,000
Less: Amount realized on sale of old machine	20,000
Net Cash Outflow	94,000

Remaining life = 1 yr.

So, Rs. 64,000 has been charged.

Therefore, net value of machine = Rs. 80,000 − 64,000 =Rs. 16,000

Profit = Rs. 20,000 − 16,000 = Rs. 4,000

*Depreciation = 80,000/5 = Rs.16, 000 p.a.

INFLATION AND CASH FLOWS

With the passage of time, inflation will have an impact on the cash flows. For example, wage rates will increase in the future as a result of inflation. Therefore, the effects of inflation need to be correctly incorporated in the capital budgeting analysis for the success of the projects. This is where; time value of money becomes important in a capital budgeting analysis (as discussed in the preceding chapter).

Example:

Mr. A is planning to buy a new machine that will last for 5 years. The machine will replace two workers. The workers are paid Rs. 100 per hour. So, if we buy the machine, our annual savings (for a 50-week year) are:

= 2 workers × Rs. 100 per hour × 40 hours per week × 50 weeks per year

= Rs. 400,000 per year (for the next 5 years).

However, if we do not buy the machine and continue with the workers, the workers may ask for a pay revision each year to offset the effects of inflation (i.e., cost of living).

So, the workers' wages would actually be (assuming 2% inflation rate):

Year	1	Rs. 400,000
Year	2	408,000
Year	3	416,000
Year	4	424,000
Year	5	432,000

Now, the question is, "While choosing between buying a machine and not buying a machine, should we use the 'option 1' of savings of constant amount of Rs. 400,000 per year for 5 years or 'option 2' where, the numbers increase by Rs. 8,000 per year to compensate the workers for inflation?" In other words, should the cash flows be adjusted for the impact of inflation (as indicated by option 2)?

The answer is: You have to be consistent in the relationship between the discount rate and the cash flows:

If the discount rate includes an inflation premium (as it usually does), then the cash flows reflect the inflation rate also. In other words, the actual cash flows (after the impact of inflation) should be used.

If the cash flows do not include the impact of inflation, then the inflation rate should be deducted from the discount rate.

Nominal Cash Flows vs. Real Cash Flows

To examine the effects of inflation on cash flows, it is important to note the difference between nominal cash flow and real cash flow. It is the change in the general price level that creates the difference between the two. A **nominal cash flow** means the income received in terms of rupees. On the other hand, a **real cash flow** means purchasing power of your income.

Mr. A invests Rs.10,000 at 10% rate of return at the end of the year. He will get Rs.11,000 after a year irrespective of changes in purchasing power of money. The amount of Rs.11,000 is called as nominal income, as it includes the impact of inflation. Thus, Rs. 1,000 is a nominal return on investment of the manager.

On the other hand, (let us assume next year the inflation rate is 7%. Rs.11,000 next year and Rs.10280.37 today are equivalent in terms of the purchasing power if the rate of inflation is 7%) Rs. 280.37 is real income as it is adjusted for the effect of inflation. Though Mr. A's nominal rate of return is Rs. 1,000, but his real return is only Rs. 280.

So, in a capital budgeting decision on account of inflation, the annual after tax cash flow of a project is equal to:

$$(R - C - D)(1 - T) + D = (R - C)(I - T) + DT$$

Here, R = Revenue
C = Cost
D = Depreciation
T = Tax rate

The first component on the right hand side, (R−C) (1−T) is affected by inflation. However, the second component DT is not affected because depreciation is based on historical cost. So, the effect of inflation is to reduce the real rate of return.

Illustration:

Initial investment = Rs. 1,00,000
Useful life = 3 years

Salvage value = 0
Annual revenue = Rs. 6,000 (without taking into account inflation of 10%)
Annual expenses (other than depreciation) = Rs. 40,000
Tax rate = 40%
Depreciation method = SLM

Calculate the net cash flows and the real cash flows.

Solution:

(a) No inflation

Table 7.1 Operational Cash Flows

Year	1	2	3
a. Revenues	100000	100000	100000
b. Cost	40000	40000	40000
c. Depreciation	20000	20000	20000
d. Taxable profit [a − (b + c)]	40000	40000	40000
e. Tax (40% of d)	16000	16000	16000
f. Profit after tax (d−e)	24000	24000	24000
g. Net cash flows (f + c)	44000	44000	44000

(b) Inflation of 10%

Inflation will increase cost and revenue.

Table 7.2 Operational Cash Flows

Year	1	2	3
a. Revenues	110000	121000	133100
b. Cost	44000	48400	53240
c. Depreciation	20000	20000	20000
d. Taxable profit [a − (b + c)]	46000	52600	59860
e. Tax (40% of d)	18400	21040	23944
f. Profit after tax (d−e)	27600	31560	35916
g. Net cash flows (f + c)	47600	51560	55916

The real cash flows after deflating inflation are:

Year	1	2	3
Real cash flows	43273	46873	50833

Therefore, from the above we can conclude that the real cash flows are less than the net cash flows when inflation is not taken in account.

CHAPTER 8

Capital Budgeting Appraisal Methods

The Present Chapter
It discusses in detail the different techniques of capital budgeting appraisal used by the business enterprises for evaluating a capital project.

Introduction

Capital investment evaluation is a very important task as the success of a project is based on its evaluation results. There are various techniques which are used to evaluate the project, comprising based on time value and not based on time value.

A good capital budgeting technique should consider all cash flows to determine the true profitability of the project and rank the projects according to its true profitability.

Capital budgeting techniques are grouped in the following two categories:

(a) Capital budgeting techniques under certainty; and
(b) Capital budgeting techniques under uncertainty

A. Capital Budgeting Techniques under Certainty:

These techniques are divided into following two groups:

I Nondiscounted Cash Flow Techniques

(i) Pay Back Period (PBP)

(ii) Accounting Rate of Return (ARR)

II Discounted Cash Flow Techniques

(i) Discounted Payback

(ii) Net Present Value (NPV)

(iii) Adjusted Present Value (APV)

(iv) Profitability Index (PI)

(v) Internal Rate of Return (IRR)

(vi) Modified Internal Rate of Return (MIRR)

Nondiscounted Cash Flow Techniques

1. Payback period. The payback period is the traditional method of capital budgeting. It is the simplest and the most widely used method for appraising capital budgeting decision. It is defined as, "the time period required to recover the initial investment of the project."

It is computed as:

$$\frac{\text{Initial investment}}{\text{Annual cash inflow}}$$

Acceptance/Rejection rule:

If Payback period > Predetermined period/Cut-off rate, Reject, and vice-versa.

Case 1: Even cash inflows

A project requires Rs. 50,000 as initial investment. The annual cash inflows generated is Rs. 10,000 for ten years. Calculate the payback period.

Solution:

$$\text{Payback Period} = \frac{\text{Initial investment}}{\text{Annual cashflow}}$$

$$= \frac{\text{Rs. 50,000}}{\text{Rs. 10,000}} = 5 \text{ years}$$

Case 2: Uneven cash inflows

A project requires Rs. 26,000 as initial investment. The annual cash inflows for 5 years are Rs. 10,000, Rs. 8,000, Rs. 7,000, Rs. 5,000, and Rs. 4,000. Calculate the payback period.

Solution:

Initial Investment =Rs. 50,000

Year	Cash inflows	Cumulative cash inflows
1	Rs. 10,000	Rs.10,000
2	8,000	18,000
3	7,000	25,000
4	5,000	30,000
5	4,000	34,000

In 3 years, Rs. 25,000 has been recovered. Rs. 1,000 is left to be recovered. In the 4th year, the cash inflow is Rs. 4,000.

So,

$$\text{Payback Period} = \frac{3\,\text{years} + 1{,}000}{4{,}000}$$
$$= 3.25\,\text{years}$$
$$= 3\ \text{years and 3 months}$$

Example (Same payback period)

In the following example, the payback period for both Project A and Project B is three years, even though Project A provides more value through its Year 4 cash flow but is not really distinguished from Project B using this approach. *This is a limitation of payback period.*

Year	Project A Cash Flows	Project B Cash Flows
0	–Rs. 100	–Rs.100
1	Rs. 20	Rs. 20
2	Rs. 50	Rs. 50

Year	Project A Cash Flows	Project B Cash Flows
3	Rs. 45	Rs. 45
4	Rs. 60	Rs. 0

Merits:

1. It is simple to calculate.
2. It is easy to understand and apply.
3. It is less time-consuming as it does not require much of the time for calculation.
4. It considers the risk factor. It favors projects which generate higher cash inflows in earlier years and rejects projects which generate higher inflows in later years.
5. It considers liquidity. It selects a project which has early recovery of the investment.

Demerits:

1. It does not consider the time value of money. The discounting factor is not used here.
2. It ignores cash flows occurring after the payback period. This leads to reject projects that generate substantial inflows in later years.
3. It is a measure of capital recovery of the project, not the profitability. So, this cannot be used as the only method of accepting or rejecting a project. The organization must support this with other methods which take into account profitability of the project.
4. It does not focus on the objective of shareholders' wealth maximization.

Suitability:

The Payback method is suitable under the following circumstances:

1. It is useful for the firms which suffer from a liquidity crisis.
2. It can be very well employed by those firms which focus on short-term earning rather than long-term growth.

On account of the above limitations and limited suitability, "discounted payback period" is preferred over payback period. It is discussed under DCF techniques.

2. Accounting rate of return. The average rate of return (ARR) is the ratio of the average net income from the project to the average book value of assets of the project. It measures the rate of return on the project *using accounting profit* information. It is closely related to ROI performance measure.
It is computed as:

$$\frac{\text{Average Profit after tax}}{\text{Average Investment}} \times 100$$

Here, Average Investment = (Original Investment + Salvage Value)/2
Acceptance/Rejection rule:
If ARR > Required rate of return, Accept and vice-versa.

Example
M Ltd. is planning to invest in a project. The initial investment required for the project is Rs.50, 000. Its stream of expected earnings before depreciation, interest, and taxes (EBDIT) during five years is given below.

Year	EBDIT for Project B (in Rs.)
1	12,000
2	15,000
3	18,000
4	19,000
5	20,000

Yearly interest is zero. Tax rate is 50%. Depreciation is charged on straight-line basis. The salvage value is Rs. 5,000. Should the firm accept this project, if the minimum accounting rate of return required by the company is 20%?

Solution:

Years	1	2	3	4	5	Average
EBDIT	12,000	15,000	18,000	19,000	20,000	16,800
Less:						
Depreciation	10,000	10,000	10,000	10,000	10,000	10,000

Years	1	2	3	4	5	Average
EBIT	2,000	5,000	8,000	9,000	10,000	6,800
Less: Interest	-	-	-	-	-	-
EBT	2,000	5,000	8,000	9,000	10,000	6,800
Less: Taxes @50%	1,000	2,500	4,000	4,500	5,000	3,400
EAT/AT	1,000	2,500	4,000	4,500	5,000	3,400
Value of Investment:						
Beginning	50,000	40,000	30,000	20,000		10,000
Ending*	40,000	30,000	20,000	10,000		27,500
						(50,000 + 5,000)/2

$$\text{Accounting Rate of Return} = \frac{\text{Average Profit after tax}}{\text{Average Investment}} \times 100$$

$$\text{Accounting Rate of Return} = \frac{3,400}{27,500} \times 100$$

$$= 12.36\%$$

The company cannot accept this project, as its ARR is less than the minimum or standard rate of return.

Merits:

1. It is simple to calculate.
2. It is based on accounting information which is easily available.
3. It considers the profits over entire life of the project.

Demerits:

1. It is based on accounting profit, which is accrued profit not wholly realized profit. In other words, it does not consider cash flows in evaluating projects.
2. It also ignores the time value of money.
3. This method considers average investment which might not be a correct criterion for taking the salvage value of equipment.
4. It averages out the profit.

*Investment (Beginning) –Yearly Dep. on it

Suitability:

1. The ARR is suitable for evaluating the performance of the firm.
2. It is also useful as a control device.

II Discounted Cash Flow Techniques

Following are the steps involved in using following DCF methods:

i. Calculate the cash flows, that is, both cash inflows and cash outflows.
ii. Discount the cash flows by a discount factor.
iii. Compare the discounted cash inflows with cash outflows.

1. Discounted payback period. One of the major limitations of payback method is that it does not consider the time value of money. This is where "discounted payback" is preferred over as it solves this problem by discounting the cash flows and then calculating the payback period.

Thus, *discounted payback period* is the number of years taken in recovering the investment outlay on present value basis. But, it also has a limitation of failing to consider the cash flows beyond the payback period.

Example

A project requires investment of Rs. 50,000 and it generates cash flow for 5 years as follows.

Years	0	1	2	3	4	5
Cash flows	(50,000)	20,000	30,000	40,000	35,000	18,000

The discounting factor is 8%. Calculate payback and discounted payback.

Solution:

Years	0	1	2	3	4	5	Simple Payback	Discounted Payback
Cash flows	(50,000)	20,000	30,000	40,000	35,000	18,000		

Years	0	1	2	3	4	5	Simple Payback	Discounted Payback
Cumulative Cash flows	20,000	50,000	-	-	-	2 years		
PV@ 7%	0.926	0.857	0.794	0.735	0.681			
PV	18,520	25,710	31,760	25,725	12,258			
Cumulative PV of cash flows	18,520	44,230	75,990	1,01,715	1,13,973	2.22 years		

The simple pay back of the project is 2 years while discounted pay back is 2.22 years which is higher than simple payback because the discounted payback is using cash flows after discounting it with the cost of capital.

2. Net present value. Net Present Value (NPV) is the difference between present value of cash inflows and present value of outflows. It is calculated as:

$$\text{NPV} = \text{PV of cash inflows} - \text{of cash outflows}$$

Mathematically, it is expressed as:

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

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

Here,

C_1, C_2, …, C_n represent cash inflows
C_0 represent cash outflows
K is the discounting rate

Acceptance/Rejection Rule:
If NPV > 0, Accept the project and vice- versa

Example (Annuity cash flows)
A small sized project requires an initial investment of Rs. 10,000. It provides a net cash inflow of Rs. 5,000 each year for 5 years. If the cost of funds is 7%, calculate the net present value.

Solution:

Net Present Value = PV of cash inflows − PV of cash outflows

PV of an annuity of Re 1 for 5 years at 7% p.a. interest is Rs. 4.100

So, Present value of cash inflows = 5,000 × 4.100 = Rs. 20,500.

Hence, NPV = 20,500 − 20,000 = Rs 500

The company should go in for the project as the NPV is positive, in other words the benefits associated with the machinery are more than the costs associated with it.

Example (Mixed stream cash flows)

Alt Ltd. is planning to buy machinery for manufacturing a compressor for refrigerators. The cost of the machine is Rs. 70,000. Following are the cash flows associated with the project over its life period of 5 years.

Year	Cash Flows After Tax
1	Rs. 15,000
2	Rs. 20,000
3	Rs. 24,000
4	Rs. 22,500
5	Rs. 8,000

Determine whether the new machine should be bought or not using NPV criterion, if the target return on capital is 9%.

Solution:

Net Present Value = Present value of inflows − Present value of outflows

$$\text{Present value of inflows} = \frac{15,000}{(1+0.09)} + \frac{20,000}{(1+0.09)^2} + \frac{24,000}{(1+0.09)^3} + \frac{22,500}{(1+0.09)^4} + \frac{8,000}{(1+0.09)^5}$$

Alternatively, using present value tables we get:

Net Present Value = PV of cash inflows − PV of cash outflows

Year	1	2	3	4	5
PV at 9%	.917	.842	.772	.708	.650

Present value of inflows

$= 15,000 \times .917 + 20,000 \times .842 + 24,000 \times .772 + 22,500 \times .708 + 8,000 \times .650$

$= 13,755 + 16,840 + 18,528 + 15,930 + 5,200$

= Rs. 43,558.96.

Hence, NPV = 70,253 − 70,000 = Rs 253.

The company can go in for the machinery as the NPV is negative, in other words the benefits associated with the machinery are higher than the costs associated with it.

Merits:

This method is considered as the most appropriate measure of project appraisal due to the following reasons:

1. It considers the time value of money.
2. It takes into account all the cash flows arising out of the project over its useful life.
3. It is a complete measure of profitability.
4. This method is based on the value-additivity principle, that is, it gives result in terms of absolute value. So, the NPVs of the projects can be added to get the final picture.
5. It satisfies the firm's objective of shareholders wealth maximization.

Demerits:

1. This method requires estimation of cash inflows which may be difficult due to uncertain business environment.
2. It needs the discounting rate to discount the cash flows. Its accuracy is based on the discounting rate. So, the relative decision of the project will change with a change in the discount rate.
3. In case of mutually exclusive projects, it may not give reliable results if the projects are having unequal lives, different cash inflows, different cash outlay, and so on.
4. It does not incorporate the risk factor of the project.

Suitability:

NPV is the most suitable method of capital budgeting as it is a true measure of profitability.

3. Adjusted present value. This is similar to net present value method. The only difference is here, instead of using weighted average cost of

capital as the discount rate, ungeared cost of equity is used to discount the cash flows from a project. There is an adjustment for the tax shield as well provided by related debt capital.

This is calculated as follows:

$$\text{APV} = \text{PV of Cash Flows using Ungeared Cost of Equity} + \text{Present Value of Tax Savings}$$

Where PV stands for "present value" and "ungeared cost of equity" is the required rate of return on equity.

$$\text{Ungeared Cost of Equity (Ke)} = \text{Risk Free Rate} + \text{Asset beta } (\beta) \times (\text{Market Return} \ \ \text{Risk Free Return})$$

Decision Rule:

The decision rule for adjusted present value is the same as net present value: accept positive APV projects and reject negative APV projects.

Example

A project costing Rs. 50 million is expected to generate after tax cash flows of Rs. 10 million annually. The amount of debt is Rs. 25 million @8%

The other details are as follows:

Risk free rate is 4%, asset beta is 1.5, and required return on market is 11% Tax rate is 35%.

Calculate the APV of the project.

Solution:

$$\text{Adjusted Present Value} = \text{Present Value of Cash Flows} + \text{Present Value of Tax Savings}$$

First, let's find out the ungeared cost of equity which is $4\% + 1.5 \times (11\% - 4\%) = 14.5\%$.

Using this rate the present value of cash flows = Rs.10 million/0.145 = Rs. 68.97 million.

Initial investment is Rs. 50 million, so net present value of future cash flows using ungeared cost of equity is Rs. 18.97 million (Rs. 68.97 million − Rs. 50 million).

Present value of tax savings = Rs. 2 million × 0.35 / 0.08 = Rs. 8.75 million

Adjusted present value = Present value of cash flows
+ Present value of tax savings
= Rs. 18.97 million + Rs. 8.75 million
= Rs. 27.72 million.

As the project above has a positive APV of Rs. 27.72 million, the company should accept the project.

Merits:

1. It considers the time value of money.
2. It takes into account all the cash flows arising out of the project over its useful life.
3. It satisfies the firm's goal of shareholders wealth maximization as it rightly focuses on equity aspect.

Demerits:

1. It discounts the cash flows using cost of equity only.
2. It might not be suitable for highly leveraged firms.
3. It does not incorporate the risk factor of the project

Suitability:

APV is suitable for equity oriented projects.

4. Profitability index (PI)/Benefit-cost ratio (B/c ratio). It is the ratio of present value of cash inflows and the present value of cash outflows at the required rate of return. It is calculated as:

$$\text{PI} = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$$

Acceptance/Rejection Rule:

If PI $>$ 1, Accept the project and vice-versa.

Example

Taking the above example of Alt Ltd. in NPV and computing its PI, it will be:

$$\text{PI} = \frac{\text{Present value of cash inflows}}{\text{Present value of cash outflows}}$$
$$= \text{Rs.}\frac{70,253}{70,000}$$
$$= 1.003$$

Since the profitability index is more than one, Alt Ltd. can buy the machinery.

Case let: Innovative Project

Following is the innovative project, with a required rate of return of 5% calculate its PI.

Period	Cash Flow (millions)
0	−Rs.1,000
1	200
2	300
3	400
4	500

Solution:

The present value of the future cash flows is Rs.1,219.47.

Therefore,

$$\text{the PI is: } \frac{1,219.47}{1,000} = 1.219$$

Merits:

1. It considers the time value of money.
2. It can be a better evaluation technique than NPV in case of capital rationing especially.
3. It is consistent with the shareholders' wealth maximization.

Demerits:

1. It is not suitable when cash outflow occurs beyond the current period.

2. It is based on the estimation of cash inflows which can be difficult under rapidly changing business scenario.
3. It requires estimation of cost of capital for correct results.

Suitability:

It is suitable in evaluating capital expenditures projects as a relative measure.

5. *Internal rate of return.* It is the rate of return at which PV of cash inflows = PV of cash outflows, that is, the rate that equates the present value of cash inflows to cash outflows. IRR is the rate at which NPV is zero.

Algebraically, it is expressed as:

$$C_0 = \frac{C_1}{(1+r)} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \cdots + \frac{C_n}{(1+r)^n}$$

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

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

Acceptance/Rejection Rule:

If IRR > Required rate of return, Accept and vice-versa.

Example

Angels Industries Ltd. wants to expand its business by investing either in project A or in project B. Both the projects involve an outlay of Rs. 10,000 and have a life-span of three years. The cash flows after tax associated with projects A and B are as follows:

Year	Project A (Rs.)	Project B (Rs.)
1	2000	4000
2	4000	4000
3	6000	4000

Based on the IRR criterion, determine which project should the company invest in?

Solution:

Project A

Let r represent the IRR of project A:

$$10{,}000 = \frac{2000}{(1+r)} + \frac{4000}{(1+r)^2} + \frac{6000}{(1+r)^3}$$

$$\text{i.e., } 10{,}000 = 2000 \times \text{PVIF}_{(r\%,1\text{year})} + 4000 \times \text{PVIF}_{(r\%,2\text{years})} + 6000 \times \text{PVIF}_{(r\%,3\text{years})}$$

The value of the right hand side of the equation at 9% is = Rs. 9,834.

The value of the right hand side of the equation at 8% is = Rs. 10,044.

Hence, r will lie between 8% and 9%. Interpolating these two values we get,

$$\text{r} = 8\% + (9\% - 8\%) \times \frac{(10044 - 10000)}{(10044 - 9834)}$$

$$= 8.21\%$$

Project B

Let r represent the IRR of project A:

$$10{,}000 = \frac{4000}{(1+r)} + \frac{4000}{(1+r)^2} + \frac{4000}{(1+r)^3}$$

The PVIFA at 9% is 2.531 and PVIFA at 10% is 2.487.

NPV at 9% = 4000 × 2.531 − 10000 = 10125.18 − 10000 = 125.18

NPV at 10% = 4000 × 2.487 − 10000 = 9947.41 − 10000 = −52.59

Hence 'r' will lie between these two values.

Interpolating the two values we get,

$$r = 9\% + (10\% - 9\%) \times \frac{(10{,}125.18 - 10000)}{(10125.18 - 9947.41)}$$

$$= 9.71\%$$

Case let: R and Co.

R and Co. has to select one of the following two projects:

Cost	Project A Rs. 14,000	Project B Rs. 13,000
Cash Inflows:		
Year1	8,000	2,000
Year2	5,000	4,000
Year3	2,000	3,000
Year4	4,000	8,000

Using the IRR criterion, suggest which project is preferable?

Solution:

$$IRR = r_1 + \frac{PV_1 - I}{PV_1 - PV_2} \times r_2 - r_1$$

Here,

r_1 = Lower discount rate of the two

r_2 = Higher discount rate of the two

PV_1 = Present value of cash inflow at r_1

PV_2 = Present value of cash inflow at r_2

I = Initial Investment

First, we need to determine r_1 and r_2.

For r_1, locate a Factor in PV Annuity Table.

$$F \text{ (Factor to be located)} = \frac{I}{C}$$

I = Initial Investment

C = Average cash inflow per year

Project A

$$IRR = r_1 + \frac{PV_1 - 1}{PV_1 - PV_2} \times r_2 - r_1$$

$$F \text{ (Factor to be located)} = \frac{I}{C}$$

Factor for Project A = Rs. 14,000/Rs. 4,750* = 2.94

Locating 2.94 in PV Annuity Table for 4 years, we get r of 13%

At r_1 of 13%, PV_1 is Rs. 14,834, i.e. NPV is positive.

So, second rate come out to be 17% and PV_2 is Rs. 13,873 which gives a negative NPV.

Thus, two rates are 13% and 17%.

*8,000 + 5,000 + 2,000 + 4,000 = Rs. 19,000/4.

Applying the formula, we get for Project A:

$$\text{IRR} = r_1 + \frac{PV_1 - I}{PV_1 - PV_2} \times r_2 - r_1$$

$$\text{IRR} = 13\% + \frac{14{,}8340 - 14{,}000}{14{,}834 - 13{,}873} \times 4\%$$

$$= 13\% + \frac{834}{961} \times 4\%$$

$$= 16.47\%$$

Project B

$$\text{IRR} = r_1 + \frac{PV_1 - I}{PV_1 - PV_2} \times r_2 - r_1$$

$$\text{F (Factor to be located)} = \frac{I}{C}$$

Factor for Project A = Rs. 13,000/Rs. 4,250** = 3.05

Locating 3.05 in PV Annuity Table for 4 years, we get r of 12%

At r_1 of 12%, PV_1 is Rs. 12,193, that is, NPV is negative.

So, second rate come out to be 9% and PV_2 is Rs. 13,185 which gives a positive NPV.

Thus, two rates are 12% and 9%.

Applying the formula, we get for Project B:

$$\text{IRR} = r_1 + \frac{PV_1 - I}{PV_1 - PV_2} \times r_2 - r_1$$

$$\text{IRR} = ***9\% + \frac{13{,}185 - 13{,}000}{13{,}185 - 12{,}193} \times 3\%$$

$$= 10\% + \frac{185}{992} \times 3\%$$

$$= 10.55\%$$

Result:

Project A	Project B
16.47%√	10.55%

Merits:

1. It considers the time value of money.
2. It takes into account the total cash flows generated by a project over the entire life of the project.

** 2,000 + 4,000 + 3,000 + 8,000 = 17,000/4.

*** r_1 is taken as lower of the two rates.

3. IRR is easily comparable with cost of capital as it is expressed in percentage.
4. It satisfies the firm's objective of shareholders' wealth maximization.

Demerits:

1. It is complex and time-consuming.
2. IRR may give conflicting results in case of mutually exclusive projects.
3. There can be multiple IRRs for the same project if there are nonconventional cash flows.
4. It does not satisfy the value additive principle like NPV.

NPV vs. IRR

Both NPV and IRR will give the same results regarding a project in the following two situations:

1. When the project under consideration has conventional cash flow, that is, when an initial cash outlay is followed by a series of cash inflows.
2. When the projects are independent, the acceptance of one does not affect the acceptance of others.

The reason for similarity in results in the above cases is simple. In NPV method a proposal is accepted if NPV is positive. NPV will be positive only when the actual rate of return on investment is more than the target rate. In case of IRR method a proposal is accepted only when the IRR is higher than the target rate.

Thus, both methods will give similar results since the acceptance or rejection of the proposal under both of them is based on the actual return being higher than the required rate, that is,

NPV will be positive only if r > k' and

NPV will be negative only if r NPV would be zero only if r = k.

Ranking conflicts: NPV vs. IRR

As discussed in the capital budgeting chapter, there might be a conflict between NPV and IRR for project selection, especially in case of mutually exclusive projects.

(i) *Independent Projects*

In case of independent projects, NPV and IRR yield similar results. Here, a project is selected if NPV > 0 and it will produce the same result as when IRR $> r$.

(ii) *Mutually Exclusive Projects*

In case of mutually exclusive projects, the NPV and IRR methods may rank projects differently. Here, a project is selected if NPV > 0 and it may produce a different result than when IRR $> r$.

The reason for this problem is different reinvestment rate assumptions:

(a) Net present value: Reinvest cash flows at the required rate of return.
(b) Internal rate of return: Reinvest cash flows at the internal rate of return.

The problem is evident when there are different patterns of cash flows or different scales of cash flows.

Example: Ranking conflicts

Consider two mutually exclusive projects, Project M and Project N:

	End of Year Cash Flows	
Year	**Project M**	**Project N**
0	–100	–100
1	0	33
2	0	33
3	0	33
4	142	33

Which project is preferred and why?

Solution:

Decision at Various Required Rates of Return

	Project M	Project N	Decision
NPV @ 0%	Rs.42	Rs.32	Accept M, Reject N
NPV @ 4%	Rs.21	Rs.20	Accept M, Reject N
NPV @ 6%	Rs.12	Rs.14	Reject M, Accept N
NPV @ 10%	–Rs. 3	Rs. 5	Reject M, Accept N
NPV @ 14%	–Rs.16	–Rs. 4	Reject M, Reject N
IRR	9.16%	12.11%	

In the above case, it is evident that with different budgeted rates of return, NPV and IRR are giving conflicting results.

So, NPV and IRR's results depend on the projects' required rates of return.

Industry outlook

A number of surveys have shown that, in practice, the IRR method is more popular than the NPV approach. The reason may be that the IRR is straightforward. But, like NPV it also uses cash flows and recognizes the time value of money.

1. IRR method is easy and understandable, but the main problem with it is that it often gives unrealistic rates of return. *Let's say* the cut-off rate is 11% and the IRR is calculated as 30%. Does this mean that the management should immediately accept the project because its IRR is 30%? The answer is no! An IRR of 30% assumes that a firm has the opportunity to reinvest future cash flows at 30%. If past experience and the economy indicate that 30% is an unrealistic rate for future reinvestments, an IRR of 30% is doubtful. An IRR of 30% is not practical. So unless the calculated IRR is a reasonable rate for reinvestment of future cash flows, it should not be used as a criterion to accept or reject a project.
2. Another problem with the IRR method is that it may give different rates of return. Suppose there are two discount rates (two IRRs) that make the present value equal to the initial investment. In this case, the problem arises in deciding to which rate should be used for comparison with the cut-off rate?

So, the IRR method, despite its popularity in the business world, does have its share of problems faced by the practitioners.

Nonconventional Cash Flows: The Multiple IRR Problem?

If there is a change in the pattern of cash flows during the life of the project, it may result in multiple IRR. Thus, in case of *nonconventional cash flows* where cash flows change sign more than once during the life of the

project, there may be more than one rate that can make NPV to be zero. This scenario is called the "multiple IRR problem."

Example

Consider the following capital project with fluctuating cash flows, especially at the end of year.

Year	Cash Flow (In Million)
0	–Rs.550
1	Rs.490
2	Rs.490
3	Rs.490
4	–Rs.940

What is the IRR of this project?

Solution:

Using the equation of IRR and solving as discussed above, there will be two IRRs:

IRR= 34.25%
IRR = 2.86%

6. *Modified internal rate of return.* Though as discussed above, NPV is preferred over IRR for its conceptual superiority and directly linked to shareholders' wealth maximization, yet managers use IRR more often over NPV, being a percentage measure. This is where the modified IRR or MIRR becomes more relevant, overcoming the shortcomings of the regular IRR.

The IRR assumes the cash flows from a project are reinvested at the IRR, the modified IRR assumes that positive cash flows are reinvested at the firm's cost of capital, and the initial outlays are financed at the firm's financing cost. Therefore, MIRR more accurately reflects the cost and profitability of a project.

$$\text{MIRR} = \sqrt[n]{\frac{\text{FV (Positive Cash Flows, Cost of Capital)}}{\text{PV (Initial Outlays, Financing Cost)}}} - 1$$

The procedure for calculating MIRR is as follows:

Step 1. Calculate the present value of the costs (PVC) associated with the project, using cost of capital (r) as the discount rate:

Step 2. Calculate the terminal value (TV) of the cash inflows expected from the project.

Step 3. Obtain MIRR.

Example

A&B Limited is evaluating the following project:

Year	0	1	2	3	4	5	6
Cash flow (Rs in million)	(100)	(50)	20	60	80	100	120

The cost of capital for pentagon is 15 percent.

Solution:

(a) The present value of costs is:

$$100 + \frac{50}{1.15} = 43.47$$
$$100 + 43.37 = 143.47$$

(b) The terminal value of cash inflows is:

$$20^4(1.15) + 60^3(1.15) + 80^2(1.15) + 100(1.15) + 120$$
$$= 34.98 + 91.26 + 105.76 + 115 + 120 = 467$$

(c) The MIRR is:

$$143.47 = \frac{467}{(1+\text{MIRR})^6}$$
$$(1+\text{MIRR})^6 = 2.463$$
$$1+\text{MIRR} = 2.463^{1/6} = 1.162$$
$$\text{MIRR} = 1.162 - 1 = 0.162$$
$$= 16.2\,\text{percent}$$

Merits:

1. MIRR assumes that project cash flows are reinvested at the cost of capital, whereas the regular IRR assumes that project cash flows are reinvested at the project's own IRR. The reinvestment at cost of capital is more realistic than reinvestment at IRR and therefore MIRR reflects the true profitability of a project.
2. The problem of multiple rates does not exist with MIRR.

Demerits:

1. In case of the mutually exclusive projects of the same size, NPV and MIRR lead to the same decision irrespective of variations in life. If the mutually exclusive projects are of different in size, there may be a conflict between NPV and IRR. In such a case, MIRR is a better measure than the regular IRR in measuring true rate of return.

Effective Capital Budgeting?

The amount of money and inherent risk tied up in a capex decision is too important for any annual budget. Therefore, Capital expenditure (CAPEX) needs to be separated out so it is visible, and can be subjected to an independent review process. Functionally, it should focus on the following:

- Collecting and collating the details of each project and its funding requirements;
- Evaluation against standard criteria such as payback factor and net present value;
- Managing the review process.

But not all CAPEX is so straight forward. Major projects involve people from many different parts of the organization and large amounts of investment spread over a number of years that can have a major impact on cash reserves and profitability way into the future. These big CAPEX projects are the ones that can go wrong, and can result in huge expense overruns. Since, these large CAPEX projects often run into many years, they involve a planned out approach to factors, like cost of capital, the timing of funding, exchange rates, and expected cash flows. All of these variables have a measurable impact on the viability of the project. So, they need to be managed with due care. Further, there is the added complexity about the different elements of a complex CAPEX project, such as property, plant, and taxes. They need to be treated according to the prevailing accounting standards for forecasting results.

The majority of capital budgeting solutions fall short on two counts:

- Many still run in batch model rather than in real-time, so users are not always able to find out how changing input variables impact critical measures such as ROI and NPV,
- Secondly, financial models in capex solutions usually require expert skills which may be beyond the finance departments.

The role of finance in large CAPEX projects goes well beyond collating the data and managing approvals. Today, they need to be involved in capital planning and budgeting processes at the very beginning and develop a deep understanding of the underlying critical success factors and how different funding options impact a project's long-term success.

Factors for Effective CAPEX Management

Every business faces capital budgeting decisions in their life-cycle. The most common of these is the simple "yes" versus "no" choice about a capital investment. The following are key factors which provide guidance in these situations.

1. *Focus on cash flows*, not profits. Cash flows indicate the economic reality of the project. Accounting profits are earned profits which might not be actual. Cash flows, on the other hand, are real
2. *Focus on incremental cash flows.* The premise of capital investment decision making is to find out whether the firm will be better off or worse off after undertaking the project. Thus, the focus should be on the changes in cash flows affected by the project. There should be a detailed analysis, considering all the possible alternatives. For example, a proposal to invest in a new machine should explore questions: Is it necessary to replace the old machine? Will the new machine expand capacity? Will the machine reduce costs at current level of operations leading to increased efficiently? Will the machine result in secondary benefits of quality improvement, operational flexibility, and so on. The key parameter off project decision should be, "How will things change (i.e., be better or worse) if we undertake the project?"

3. *Consider "Time vale of money."* Cash flows should be recoverable as soon as possible. NPV is a better technique to incorporate the relevance of the project.
4. *Incorporate the risk factor.* All projects do not have same level or risk. Risky projects should be compensated with a higher return for taking more risk. Organizations using risk mitigation techniques make better investment decisions than organizations that do not use these.

Capital Budgeting Practices: Business vs. Government

Despite certain similarities, the differences between the way capital budgeting is done in the private sector and governmental budgeting are in several respects.

In the *first place*, most private entities employ multiple capital budgeting techniques: Payback, NPV, and IRR. Private-sector capital budgeting is concerned only with decisions that have significant future consequences. Therefore, its time horizon is the life of the decision. There has to be a distinction between operating budgeting and capital budgeting decision. In the operating decision the relevant time horizon is the operational cycle of the project in question, and the focus is on the current performance. It is concerned with working capital management. Most governments try to make one process do the work of three, which is the cause of failure of these projects.

Second, private-sector capital budgeting is selective. It is usually concerned only with new initiatives, and with long-term decisions that are expected to yield real benefits, whereas governmental budgeting is more comprehensive. All planned asset acquisitions, including current assets as well as long-term assets, are typically included under the appropriations process.

Third, private-sector capital budgeting tends to be a continuous process. Most well managed firms always have multiple initiatives under development. The decision to undertake an initiative is decided based on its viability. In contrast, capital budgeting in the government tends to be repetitive—most appropriations are done on annual basis.

Fourth, the objective of capital budgeting in the private sector is the identification of options with positive net present values, in consideration

of firm's goal of shareholders wealth maximization. The government decisions are guided by cost-benefit parameters as they are oriented toward public utility.

In the private sector, operating budgeting serves more of a management control device. They are a means of motivating managers to serve the policies and purposes of the organizations to which they belong. In the private sector, capital budgeting is not primarily a process for detecting and correcting performance errors. In operating budgeting, an organization's commitments, the results of all past capital budgeting decisions, are converted into authority-responsibility relationship of the units and their managers.

Though business and government use similar terms for capital budgeting, yet they often refer to different things. For example, many state and local authorities remove large-scale investments in plant and equipment (highway construction, public housing, educational facilities, hospitals, and so on.) from their operating budgets to a plant or capital budget. Often they borrow the cash used to make these investments and match repayment of principle and interest payments to the life of the asset. These payments are then charged to the operating fund. This procedure turns capital budgeting practice on its head, that is, instead of converting future flows of benefits and costs to present values, large current outlays are converted into a stream of future payments.

CHAPTER 9

Risk Analysis in Capital Budgeting

The Present Chapter
It discusses the capital budgeting techniques used in evaluating a project under risk (uncertainty).

Introduction

Every project has some amount of risk. Therefore, incorporation of risk factor in the discounting rate becomes crucial for project decision. **Risk** exists because of the inability of the decision maker to make perfect forecasts.

There are three broad categories of the events influencing the investment forecasts:

a. *General economic conditions*
b. *Industry factors*
c. *Company factors*

What is Risk?

The risk associated with an investment may be defined as, "the variability that is likely to occur in future returns from the investment." It is the difference that exists between estimated returns and actual returns.

In Risk, future loss can be foreseen but not in uncertainty. Uncertainty is a situation where a range of differing outcome is possible, but it is not possible to assign probabilities to this range of outcomes. In investment appraisal, managers have to evaluate the riskiness of a project's future cash flows. There is always a probability that the actual cash flows will differ from expected cash flows. The common measures of risk are discussed in the following section. There are three types of risks associated with a project:

(i) *Stand-alone risk*: This is the risk of the project itself which is measured in isolation from any other effect.
(ii) *Corporate risk*: This is the total or overall risk of the firm, viewed as a portfolio of investment projects.
(iii) *Market or systematic risk*: This is defined from the view point of shareholders and investors. **Market risk** is essentially the stock market's assessment of a firm's risk, measured by its beta, and its affect on share price.

Techniques for Risk Analysis

A. Statistical Techniques

Statistical techniques which are used for risk analysis are discussed as follows:

- Probability measure
- Expected Net Present Value (ENPV)
- Standard Deviation
- Coefficient of Variation

1. Probability Measure

Probability measure is a fundamental technique in risk analysis. It is defined as the likelihood of occurrence of an event. If an event is certain to occur, the probability of its occurrence is one but if an event is certain

not to occur, the probability of its occurrence is zero. Thus, probability of all events to occur lies between zero and one.

2. Expected Net Present Value

Once the probability has been assigned to the future cash flows, the next step is to find out the ENPV. It can be found out by multiplying the monetary values of the possible events by their probabilities. The following equation describes the ENPV.

$$\text{ENPV} = \sum_{t=0}^{n} \frac{ENCFt}{(1+k)t}$$

Where ENPV is the expected net present value, ENCFt represents expected net cash flows in period t. k is the discount rate.

The expected net cash flow can be calculated as follows:

$$ENCFt = NCFnt \times Pnt$$

Where NCFnt is net cash flow for nth event in period t and Pnt is the probability of net cash flow for nth event in period t.

Example

A company is considering an investment proposal costing Rs. 7,000 and has an estimated life of three years. The risk-free discount rate is 9%. The possible cash flows are given below:

Cash flow	Prob.	Expected value	Cash flow	Prob.	Expected value	Cash flow	Prob.	Expected value
1000	0.2	200	2000	0.2	400	3000	0.3	900
2000	0.3	600	4000	0.4	1600	5000	0.4	2000
3000	0.5	1500	5000	0.4	2000	5000	0.2	1000
		2300			4000			3900

Expected NPV

Year	ENCF	PV@9%	PV
1	2300	0.917	2109.1
2	4000	0.841	3364

Year	ENCF	PV@9%	PV
3	3900	0.772	3010.8
		ΣPV	8483.9
		Less: Cash outflow	7000
		ENPV (Rs.)	1483.9

3. Standard Deviation

Standard deviation (σ) is an absolute measure of risk analysis and it can be used in case of projects with similar cash outlay. It is the square root of variance and variance measures the deviation about expected cash flow of each of the possible cash flows.

4. Coefficient of Variation

Coefficient of variation is a relative measure of dispersion and used where the projects involve different outlays/different expected value. It is calculated as follows:

$$C.V. = \sigma/\text{Expected value} * 100$$

B. Financial Techniques

Following are the financial techniques which are used to incorporate the risk element in the discounting rate for project decisions:

- Certainty-equivalent coefficient/Conservative estimates
- Payback
- Break-even point/Margin of safety
- Risk-adjusted discount rate
- Key factor
- Shut-down factor
- Sensitivity analysis
- Scenario analysis
- Simulation
- Decision tree approach

1. Certainty-Equivalent Coefficient /Conservative Estimates

Certainty-equivalent coefficient is used to find out the certainty factor of cash flows in a project.

It is based on three assumptions:

- *Underestimate revenue*
- *Overestimate expenses*
- *Make a provision for contingencies*

It is calculated as:

$$\text{Certainty-equivalent coefficient} = \frac{\text{Certain cash flow/Risk-less cash flow}}{\text{Risky cash flow}}$$

Formally, equivalent coefficient is expressed as:

$$\text{NPV} = \sum_{t=0}^{n} \frac{\alpha_t \text{NCF}_t}{(1+k_f)^t}$$

Steps

i. Compute *certainty-equivalent coefficient* and reduce the forecasts of cash flows to some conservative levels.
ii. Multiply cash flows with the coefficient to get certain cash flows:
iii. Cash flows × Certainty-equivalent coefficient = Certain cash flows.
iv. Discount certain cash flows at risk-*free rate*.

The certainty-equivalent coefficient assumes a value between 0 and 1, and varies inversely with risk.

Example

A project is expected to generate a cash flow of Rs. 10,000. The project is risky but the management feels that it will get at least a cash flow of Rs. 6,000. What is the certainty coefficient?

Solution:

$$\text{Certainty equivalent cash flow} = \frac{6{,}000}{10{,}000}$$
$$= 0.6$$

Case let

From the following data, state which project is better if certainty-equivalent coefficients are:

	Project A	Project B
1	.90	.80
2	.80	.70
3	.50	.60

Cash flows:

Year			
	0	Rs. −15,000	Rs. −15,000
	1	5,000	5,000
	2	4,000	5,000
	3	2,000	3,000

Risk-less discount rate is 4%.

Solution:

PVIF at 4% I Yr. .961 II Yr. .924 III Yr. .889

Discounted Cash Flows at Risk-free rate of 4%

Year	A	Certain Cash Flows	PV	B	Certain Cash Flows	PV
		Rs.				
0		−15,000	−15,000		−15,000	−15,000
1	(5,000 × .90)	4,500	4,324	(5,000 × .80)	4,000	3,844
2	(4,000 × .80)	3,200	2,957	(5,000 × .70)	3,500	3,234
3	(2,000 × .50)	1,000	889	(3,000 × .60)	1,800	1,600
			8,170			8,678
NPV			−6,830			−6,322

Though Project B is better but due to negative NPV of both, none can be accepted.

2. Payback

This method, as applied in practice, is used more for risk measurement in capital budgeting decision rather than a method to measure profitability.

Following are the merits of payback:

(a) It is simple in approach.
(b) It focuses on the near future and thereby emphasizes on the liquidity of the firm through recovery of capital.
(c) It favors short term projects over long-term, riskier projects.

3. Break-even Point

It indicates the point of survival with recovery of total cost.

$$\text{Break-even Point (of output/number of units)} = \frac{\text{Fixed Cost}}{\text{Contribution per unit}}$$

$$\text{Break-even Point (of sales)} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$$

Margin of safety

It is the distance between actual and break-even sales. It is an indicator of the strength of a business. Therefore, it should be as long as possible.

Basically, it signifies the cushion over and above the break-even sales. By looking at margin of safety, one can find out how much sale could fall before going into red.

It is calculated as: Estimated Sales − Sales at Break-even Point

Example

A company produces a single product
S.P. per unit – Rs. 30
V.C. per unit – Rs. 20
Total fixed cost – Rs. 1, 00,000
Actual Sales = 15,000 units
Calculate margin of safety.

Solution:

$$\text{Break-even sales} = \frac{\text{1, 00,000 (Fixed cost)}}{\text{10 (Contribution)}}$$

Break-even sales to cover fixed cost = 10,000 units.
Margin of safety = Rs. 15,000 – Rs.10,000 = Rs.5,000
or 5,000/15,000 × 100 = 33.33%.

Implications:

- If a company can sell more than 10,000 units, it will earn profit as fixed cost remains constant. If it sells less than 10,000, there will be a loss.
- A high margin will indicate that profit will be made even if there is a substantial fall in sales or production by, say 30%, the company will still make profits.
- If margin is small, say 25 %, a small drop in sales or production will be a serious matter.

Case let

"MOS" – Inter-company comparison

	Company A	**Company B**
	Rs.	**Rs.**
Total sales	2, 00,000	4, 00,000
Break-even sales	1, 00,000	2, 50,000

Solution:

M/S	1, 00,000	1,50,000
Or	50%	37.50%

Break-even sales wise, Company B seems to be stronger than A.

But, margin of safety tells the other story. Company A is stronger than B.

So, "MOS" is useful in inter-firm comparison to indicate the relative position of firms.

4. Risk-Adjusted Discount Rate

Investors expect a higher rate of return on risky projects as compared to less risky projects. So, a higher discount rate is used for more risky projects, whereas a lower discount rate is used for less risky projects.

Risk-adjusted Discount Rate:

= Risk-free rate + risk-premium rate

Risk-adjusted discount rate allows for both time preference and risk preference.

Example

From the following data, state whether the project should be taken?

Project A

Cash flows:

Year		
	0	Rs. –60,000
	1	25,000
	2	20,000
	3	10,000
	4	10,000

Risk-less (risk-free) discount rate is 10%. Project A is perceived to be a risky project. The management considers risk-premium rate at 5% for discounting the cash flows.

Solution:

Risk-free rate = 10%

Risk-adjusted discount rate = 10% + 5% = 15%

Discounted Cash Flows

Year	At 10%		At 15%	
0	Rs. −60,000		Rs. −60,000	
1	(25,000 × .909)	22,725	(25,000 × .869)	21,725
2	(20,000 × .826)	16,520	(20,000 × .756)	15,120

Year	At 10%		At 15%	
3	(10,000 × .751)	7,510	(10,000 × .657)	6,570
4	(10,000 × .683)	6,830	(10,000 × .571)	5,710
		53,585		49,125
NPV		−6,415		−10,875

5. Key Factor

It is the limiting factor which influences the project decision-making to a critical level. That's why; it is also called as critical factor.

Example

A Ltd. is a labor-intensive company.

Comment on the relative risk and profitability of the following products in regard to man-hours:

	Product 1	**Product 2**
	Rs.	Rs.
Materials	400	300
Wages	100	200
Fixed Overhead	250	100
Variable Overhead	150	200
Profit	200	300
	1,100	1,100
Man-hours per week	250 hrs.	200 hrs.

Solution:

Comparative Statement of Risk & Profitability

	Product 1	**Product 2**
	Rs.	**Rs.**
Sale Price per unit (S = C + P)	1,100	1,100
Less: Variable cost per unit (Materials + Wages + Variable Overhead)	650	700
Contribution per unit	*450*	*400*
Less: Fixed cost per unit	250	100
Profit *per unit*	200	300
Contribution per hr. (Contribution/Hrs.)	*1.80*	*2.00*

Contribution per unit and P/V Ratio are higher in case of product A.

If hrs. is the limiting factor, product B is more profitable, otherwise product A would be more profitable. It means product A is more risky on account of labor.

6. Risk of Shut down

(Operate or Shut down)

Here, the focus is to decide the risk level with regard to operate vs. shut down for a project or business as a whole.

Example

M&Co. is operating below 50% of its capacity. It expects that the volume of sales will drop the present level of 10,000 units per month. Management is concerned that a further drop in sales volume will create a loss and therefore plans to suspend the operations, until better market conditions prevail and also there is a better selling price.

Present operating Income Statement

Sales revenue (10,000 units @ Rs. 3)		Rs. 30,000
Less: Variable costs@ Rs. 2 per unit	20,000	
Fixed costs	10,000	30,000
Net income		0

Fixed cost at shut down will be Rs. 4,000

Find out the risk level of shut down.

Solution:

Shut-down risk is there when sales volume drops below 6,000 units per month.

Fixed cost if plant operates = Rs. 10,000

Fixed cost if plant shuts down = Rs, 4,000

So, Additional costs to be recovered when operating = Rs. 6,000

7. Sensitivity Analysis

Sensitivity analysis is a technique of analyzing change in the project's NPV (or IRR) for a given change in one of the variables. It analyzes how

NPV or IRR changes with change in any of the input variables (e. g., the initial outlay, selling prices, sales volumes, project life span, and so on.). That's why it is also called as "what if analysis."

The following steps are involved in the use of sensitivity analysis:

(a) Identification of all those variables, which have an influence on the project's NPV (or IRR).
(b) Analysis of the impact of the change in each of the variables on the project's NPV.

Why Sensitivity Analysis?

(i) To determine how sensitive the NPV/IRR is to changes in any of the key variables, and
(ii) To identify which variable has the most significant impact on NPV/IRR.

Case Study (AB Company)

The financial manager of AB socks manufacturing Co. is considering the installation of a plant of Rs. 1 lakh with a life of 4 years to increase its processing capacity. The expected values of the key variables are as follows:

1. Investment (Rs.)	1, 00,000
2. Sales Volume (units)	10,000
3. Unit Selling Price (Rs.)	15
4. Unit Variable Cost (Rs.)	6.75
5. Annual Fixed Cost (Rs.)	40,000
6. Depreciation (WDV)	25%
7. Corporate Tax Rate	35%
8. Discount Rate	12%

The financial manager wishes to find out the effect on NPV if any of the following variables changes:

Critical Variables		
Sales Volume	25% Increase	25% Decrease
Unit Selling Price (Rs.)	25% Increase	25% Decrease
Unit Variable Cost (Rs.)	25% Increase	25% Decrease

Salvage value is assumed to be zero

Solution:

Net Present Value = PV of cash inflows – PV of cash outflows

Cash Outflow = Rs. 1, 00,000

Cash Inflows = ?

Cash Inflows (Rs.)

	1	2	3	4
Revenue	15, 00,000	15, 00,000	15, 00,000	15, 00,000
Less: Variable Cost	67,500	67,500	67,500	67,500
Fixed Cost	40,000	40,000	40,000	40,000
Depreciation	25,000	18,750	14,063	10,547
EBIT	13, 67,500	13, 73,750	13, 78,437	13, 81,953
Less: Tax	4, 78,625	4, 80,813	4, 82,453	4, 83,684
PAT	8, 88,875	8, 92,937	8, 95,984	8, 98,269
Net Cash Inflow (PAT + Depreciation)	9, 13,875	9, 11,687	9, 10,047	9, 08,816

Critical Variables

Sales Volume Present = 1,000	25% Increase	25% Decrease
	1,250	750
Unit Selling Price (Rs) Present = Rs.15	25% Increase	25% Decrease
	16.50	12.75
Unit Variable Cost (Rs) Present = Rs.6.75	25% Increase	25% Decrease
	7.425	6.075

Year	1	2	3	4
PV at 12%	.893	.797	.712	.636

Present value of inflows

= 9,13,875 × .893 + 9,11,687 × .797 + 9,10,047 × .712 + 9,08,816 × .636

= 8,16,090 + 7,26,615 + 6,47,953 + 5,78,007
= Rs. 27, 68,665

Hence, NPV = 27, 68,665 – 1, 00,000 = Rs. 26, 68,665

8. Scenario Analysis

It analyzes the impact of alternative combinations of variables, called *scenarios,* on the project's NPV (or IRR).

The various scenarios which are developed for this purpose are:

- Pessimistic,
- Optimistic,
- Most likely

The sensitivity analysis assumes that variables are independent of each other. In practice, the variables will be interrelated and they may change in combination. This is where 'scenario analysis' is useful.

(i) *For Optimistic*
Higher estimates are made for selling prices and sales volumes and lower estimates for unit costs, and so on.

(ii) *For Pessimistic*
More Pessimistic assumptions and estimates are made.

Risk Measurement: Optimistic NPV − Pessimistic NPV
= Range [A statistical measure of dispersion (risk)]

Case Study (XY Water Purifying Company)

The financial manager of XY Water Purifying Co. is considering purchasing a machine of Rs. 10,000 to increase its purifying capacity. The life span of the machine is 4 years. The expected values of the key variables are as follows:

1. Investment(Rs.)	10,000
2. Sales Volume (units -liter)	1,00,000
3. Unit Selling Price (Re 1 liter)	1

4. Unit Variable Cost (Rs)	.50
5. Annual Fixed Cost (Rs)	25,000
6. Depreciation (SLM)	25%
7. Corporate Tax Rate	35%
8. Discount Rate	10%

The financial manager wishes to find out the effect on NPV of the following scenarios:

Scenarios				
Base Values		Pessimistic	Optimistic	Most likely
Variables:				
Selling Price (Rs.)	1	.75	1.25	1.25
Sales Volume (units)	1,00,000	75,000	1,25,000	80,000
Variable Cost (Rs.)	.50	.60	.50	.55
Fixed Cost (Rs.)	25,000	30,000	20,000	25,000

Solution:

Net Present Value = PV of cash inflows − PV of cash outflows

Cash Outflow = Rs. 10,000

Cash Inflows = ?

1. *Cash Inflows (Base Values, Rs.)*

	1	2	3	4
Revenue	1, 00,000	1, 00,000	1, 00,000	1, 00,000
Less: Variable Cost	50,000	50,000	50,000	50,000
Fixed Cost	25,000	25,000	25,000	25,000
Depreciation	2,500	2,500	2,500	2,500
EBIT	22,500	22,500	22,500	22,500
Less: Tax	7,875	7,875	7,875	7,875
PAT 14,625	14,625	14,625	14,625	
Net Cash Inflows (PAT + Depreciation)	17,125	17,125	17,125	17,125

Present value of inflows (At 10% for 4 years)
= 17,125 × 3.170
= Rs. 54,286
Hence, NPV = 54,286 − 10,000 = Rs. 44,286

2. Cash Inflows (Pessimistic, Rs.)

S.P. = Re .75 Sales Volume = 75,000 units
V.C. = Re .60 Fixed Cost = Rs. 30,000

	1	2	3	4
Revenue	56,250	56,250	56,250	56,250
Less: Variable Cost	45,000	45,000	45,000	45,000
Fixed Cost	30,000	30,000	30,000	30,000
Depreciation	2,500	2,500	2,500	2,500
EBIT	(21,250)	(21,250)	(21,250)	
			(21,250)	
Less: Tax	-	-	-	-
PAT	(21,250)	(21,250)	(21,250)	(21,250)
Net Cash Inflows (PAT + Depreciation)	(18,750)	(18,750)	(18,750)	(18,750)

Present value of inflows (At 10% for 4 years)
= (18,750) × 3.170
= Rs. (59,438)
Hence, NPV = −59,438 − 10,000 = Rs. −69,438

3. *Cash Inflows (Optimistic, Rs.)*

S.P. = Rs. 1.25 Sales Volume = 1, 25,000 units
V.C. = Re .50 Fixed Cost = Rs. 20,000

	1	2	3	4
Revenue	1, 56,250	1, 56,250	1, 56,250	1, 56,250
Less: Variable Cost	62,500	62,500	62,500	62,500
Fixed Cost	20,000	20,000	20,000	20,000
Depreciation	2,500	2,500	2,500	2,500
EBIT	71,250	71,250	71,250	71,250

Less: Tax	24,938	24,938	24,938	24,938
PAT	46,312	46,312	46,312	46,312
Net Cash Inflows (PAT + Depreciation)	48,812	48,812	48,812	48,812

Present value of inflows (At 10% for 4 years)
= 48,812 × 3.170
= Rs. 1, 54,734
Hence, NPV = 1,54,734 – 10,000 = Rs. 1, 44,734

4. *Cash Inflows (Most likely, Rs.)*

S.P. = Rs. 1.25 Sales Volume = 80,000 units
V.C. = Re .55 Fixed Cost = Rs. 25,000

	1	2	3	4
Revenue	1, 00,000	1,00,000	1,00,000	1, 00,000
Less: Variable Cost	44,000	44,000	44,000	44,000
Fixed Cost	25,000	25,000	25,000	25,000
Depreciation	2,500	2,500	2,500	2,500
EBIT	28,500	28,500	28,500	28,500
Less: Tax	9,975	9,975	9,975	9,975
PAT	18,525	18,525	18,525	18,525
Net Cash Inflows (PAT + Depreciation)	21,025	21,025	21,025	21,025

Present value of inflows (At 10% for 4 years)
= 21,025 × 3.170
= Rs. 66,649
Hence, NPV = 66,649 − 10,000 = Rs. 56,649
Comparative Picture

Present NPV	Rs. 44,286
NPV (Pessimistic)	Rs. −69,438
NPV (Optimistic)	Rs. 1, 44,734
NPV (Most likely)	Rs. 56,649

Range = 1, 44,734 − (−69,438)
= Rs. 2, 14,172

9. Simulation Analysis

It is the computerized version of scenario analysis which uses continuous probability distributions.

The values are selected for each variable based on given probability distributions, and then NPV and IRR are calculated.

The Process is repeated many times (may be 1,000 or more). The end result is probability distribution of NPV and IRR based on sample of simulated values.

10. Decision Tree Analysis

Decision tree is a graphic display of relationship between a present decision and possible future event, future decisions and their consequences. It is used for sequential investment decisions.

Steps in Decision Tree Approach:

1. *Define investment plan.* An investment plan could be launching a new product, purchasing a plant or development of the existing plant.
2. *Identify decision alternatives.* Once the investment plan is identified, the next step is to identify the possible alternatives. For example, if the plan is to purchase a plant the alternatives developed would be:
   - Not to purchase the plant
   - To purchase a large plant
   - To purchase a small plant
   - To purchase a medium plant
3. *Draw a decision tree.* Following information is needed here:
   - Decision points (cash outlay)
   - Chance events (Graph the projected cash flows, probability, the expected present values, etc. on the decision tree branches.)
4. *Analyze data*. This is the final stage where data is analyzed and meaningful conclusion is drawn for application.

CHAPTER 10

Capital Budgeting Under Capital Rationing

The Present Chapter

It discusses the capital budgeting practices under capital rationing.

Introduction

Capital rationing implies investment in projects within limited capital resources. It is the process of allocating money among different projects, where the amount of money to be invested is limited. Companies ration their capital and investments among different opportunities as countries use rationing of food. In case of capital rationing, the company may not be able to invest in all profitable projects. Therefore, the key to decision making under capital rationing is to select those projects that maximize the total net present value given the capital budget limit.

Capital rationing provides a practical approach to the capital budgeting because in real life situations, the possibility of limited financial resources is obvious. In capital rationing the most important criterion for investment decision is neither the NPV nor IRR, rather it is "percent budget utilization." In other words, what percentage of the total money to be invested is mobilized? Money is always in short supply and it is only the available amount of money that a company has to spend in different projects. Therefore, it is important to mobilize as much money as possible in the projects on which IRR is greater than risk free rate for maximizing the return on your portfolio.

Capital Rationing Method

The capital rationing method consists of the following steps. The steps are

1. Evaluate the investment proposals using the capital budgeting techniques of Net Present Value (NPV), Internal Rate of Return (IRR), and Profitability Index (PI).
2. Rank them based on the above criterion.
3. Select the projects in descending order of their profitability within the given capital budget.
4. Compare the result of each technique with respect to total NPV and select the best project.

Example

Suppose there are five projects with below mentioned cash outflow and their evaluation results based on NPV and IRR along with their respective rankings. The capital investment budget is Rs. 500 million.

Projects	Initial cash outflow	Evaluation		Ranking	
		NPV	IRR	NPV	IRR
A	250	150	18%	2	5
B	250	250	20%	1	4
C	200	100	25%	5	3
D	150	120	30%	3	1
E	100	110	28%	4	2

Based on individual method, following result will be obtained:

NPV			
Projects	ICO	NPV	IRR
B	250	250	
A	250	150	
	500	400	

IRR			
Projects	**ICO**	**NPV**	**IRR**
D	150	120	30%
E	100	110	28%
C	**200**	**100**	25%
	450	**330**	

So, we will go with B and A to achieve maximum value of 400.

Case let

Consider the following projects with a required rate of return of 4%. Which projects, if any, should be selected if the capital budget is?

(a) Rs.100?
(b) Rs.200?
(c) Rs.300?
(d) Rs.400?
(e) Rs.500?

Solution:

Possible decisions:

Budget	Choices	NPV	Choices	NPV	Choices	NPV
Rs. 100	One	Rs. 20				
Rs. 200	One	Rs. 20	Two	Rs. 15		
Rs. 300	One + Five	Rs. 35	Two	Rs. 15		
Rs. 400	One + Two	Rs. 50	Three	Rs. 40		
Rs. 500	One + Three	Rs. 60	Four	Rs. 45	Two + Five	Rs. 45

Optimal choices

So, the project which maximizes the total net present value for any given budget is selected.

Types of Capital Rationing

Under capital rationing, the management has to determine not only the profitable investment opportunities, but also it has to obtain that

combination of the profitable projects which yields highest NPV within the available funds.

Capital rationing may rise due to external factors or internal constraints imposed by the management. Thus, there are two types of capital rationing.

- External capital rationing
- Internal capital rationing

External Capital Rationing

It mainly occurs on account of the imperfections in capital markets. Imperfections may be caused by deficiencies in market information, or due to lack of free flow of capital. The NPV method will not be useful if capital markets are not favorable for shareholders.

Internal Capital Rationing

It is caused by internal constraints on account of policy of the management. For example, it may be decided not to obtain additional funds by incurring debt as a part of firm's conservative financial policy. Management may fix a limit to the amount of funds to be invested by the managers in specific projects. As a result of these restrictions, some profitable projects may have to be forgone because of the lack of funds though the NPV rule works well with shareholders here.

Internal capital rationing is generally used as a means of financial controls for checking the performance of divisional managers by putting upper limits to their capital expenditures. Similarly, a growing company may put investment limits to grow at steady pace and avoid major strains and organizational problems.

Factors for Capital Rationing

In capital rationing, the most important factor is the person who is responsible for the decisions relating to capital budgeting and capital rationing.

There are situations in which one does not invest in the project despite being the best project and providing the highest return. The reasons for these capital constraints are discussed below.

1. **High investment**: The best project may require a very high initial investment and the company may not have that money. So, it is forced to reject that project.
2. **Limited resources**: The company may not have the necessary human resource, knowledge, or talent for undertaking the project. The project might have high NPV but if you cannot manage it, you are forced not to invest in that project.
3. **No debt**: If the company does not want to raise debt due to high interest burden and risk factor, it would go for capital rationing.
4. **Growing company**: If the company is starting out, there might be pressures of not going too aggressively and therefore, end up following capital rationing.

Example

There are three mutually exclusive real asset projects to choose from. Total budget is Rs.10,000.

Project	Investment (Rs.)	IRR	NPV (Rs.)
A	4,000	30%	4,000
B	5,000	40%	6,000
C	3,000	40%	5,000

Which project you will choose from the above projects?

Solution:

All three projects cannot be selected because of the budget constraint of Rs. 10,000 and the total investment in all three projects is 12,000 (= 4,000+5,000+3,000). One has to go through capital rationing process and choose from among these three different projects.

Let us explore the possible options:

Option 1:

If we select projects A and B, we have to look at the combined NPV of these projects and the average IRR of this portfolio. Then, it has to be

analyzed in the light of the capital rationing, that is, what percentage of total budget available is being utilized if we invest in these projects.

Total NPV of these two projects = 4,000 + 6,000 = 10,000
Simple Average IRR = 35% = (30 + 40)/2
NPV of Rs. 10,000 looks good relatively to the size of investments of Rs. 9,000.
Nonweighted 35% seems to be attractive IRR.
Finally, let's look at percent budget utilization for this option
Budget Utilization = 4,000 + 5,000 = 9,000 (out of 12,000)
This option is utilizing 75% of total budget.
Now we repeat the same practice for the other options available to us.

Option 2:

Select Projects B and C because they have the highest NPV's.
Total NPV = 6000 + 5000 = 11000
Average IRR = 40%
Budget Utilization = 5000 + 3000 = 8000

Summary:

Budget	Utilization	NPV	Avg IRR
Option 1	Rs.9,000 (75%)	Rs.10,000	35%
Option 2	Rs.8,000 (66.67%)	Rs.11,000	40%

It is clear from the above that option 2 is best option. It has the highest NPV of Rs. 11,000 with a budget utilization of mere 66.67% at an average IRR of 40%. The 33.33% of money available in option 2 can be used for some other projects.

But, there is another side also to this case. It has utilized only 66.67% of budget as compared to option 1 of 75%. The 33.33% of the money available for investment is wasted and is lying idle comparatively to 25% of unused money in option 1. The idle money available in company should earn some

return on it. If you do not have the attractive project to invest in, you are forced to keep it in a bank account that will yield 9% to 10%.

So, the percent of budget utilize by any portfolio is very important and it should be as close to 100 % as possible. This factor should also not be ignored.

Problems in Capital Rationing

There are numerous problems attached to capital rationing investment decisions. These are discussed below.

1. Different Size of Cash Flows

The difference in size of initial investment (or outlay) may lead to a problem of unused money. The budget utilization will be different. So, comparing a project with small cash flows taking place at regular interval to the project with large cash flows at different times results in money not utilized fully. In this way, money is being wasted.

2. Timing Difference of Cash Flows

A good project might suffer from a lower IRR even though its NPV is higher. It will earn its larger cash flows at a later point of time. These timing difference of cash flows is another bottleneck in capital rationing decisions.

3. Different (or Unequal) Lives of Different Projects

The problem can occur due to comparing two projects with different lives, like comparing a printing machine with xerox machine.

SECTION 4

Financing Decision

CHAPTER 11

Cost of Capital

The Present Chapter

It discusses the concept of cost of capital to be used as a discounting rate in capital budgeting appraisal.

Introduction

Financing of a project is equally an important task as the project selection is. Therefore, the discounting rate used in the project decision can determine the success of the project. There are various financing options available which are used for the project, (i) equity, (ii) debt and equity, and (iii) debt, equity, and preferred stock. These financing options are used, depending upon their risk-return trade-off. The discounting rate is based on the type of financing used for the project.

What Is Cost of Capital?

It is the cost of raising the funds for investment purposes. It is often referred to as *cut-off rate*, *target rate of return*, *hurdle rate.* Cost of capital and Weighted Average Cost of Capital (WACC) are used interchangeably.

It is important on account of two factors:

(i) *Capital budgeting decision*: Cost of capital is used as a yard stick to accept/reject a project.

(ii) *Capital Structure Decision*: Cost of funds is used to assess the cost-risk factor of various sources of finance and based on the cost efficiency; funds are selected for financing the project.

Classification of Costs

Costs are classified into two following categories:

1. **Explicit costs:** These are the costs that the firm pays to procure a source of finance. These are fixed and visible. They consist of
   (a) Debt
   (b) Preference shares
2. **Implicit Costs:** Here, no "assured cost" is attached to a source of finance. They are an opportunity cost. They comprise of
   (a) Equity shares
   (b) Retained earnings

Computation of Cost of Capital

The process of computation of cost of capital comprises of the following steps:

1. Compute Specific Costs (Cost of each Source of Fund)

(i) Cost of debt
(ii) Cost of preference shares
(iii) Cost of equity
(iv) Cost of retained earnings

2. Assign Weights to Specific Costs (to each Source of Fund)

(i) Book value vs. Market value
Multiply (1) by (2) to get cost of capital (WACC)

$$ko = kdwd + kpwp + kewe + krwr$$

I. Computation of Specific Costs

1. Cost of Debt

It is an explicit cost as it is fixed and known. It provides tax shield to the corporate for interest payments, that is, interest paid is tax deductible. *(See the illustration below.)*

Tax shield on Interest

25% tax rate

	A (Zero debt)	B (Rs. 2,000 debt@10%)
EBIT	1,000	1,000
Less: Interest	–	200
EBT	1,000	800
Less: Tax	250	200
PAT	750	600
Effective interest rate		7.5%

Effective rate = I (1 − T) = 10(1 − 0.25) = 7.5%

So, tax reduces the effective rate of debt for the company.

$$Cost\ of\ debt\ (kd) = \frac{I}{N}(1 - T)$$

Here, I = Annual Interest payment

NP = Sale proceeds of debentures (Par value − discount + premium − floatation cost)

T = Tax rate

Example

A company issues 10% irremediable debentures of Rs. 1, 00,000 at a face value of Rs.100. The company is in 35% tax bracket. Calculate the cost of debt (after tax) if the debentures are issued at (i) par, (ii) 10% discount, and (iii) 10% premium

Solution:

1. Issued at par

$$kd = \frac{I}{NP}(1 - T) = \frac{10}{100}(1 - 0.35) = 0.065(6.5\%)$$

2. Issued at discount

$$kd = \frac{1}{\text{NP}}(1 - \text{T}) = \frac{10}{90}(1 - 0.35) = 0.072(72\%)$$

3. Issued at premium

$$kd = \frac{\text{I}}{\text{NP}}(1 - \text{T}) = \frac{10}{110}(1 - 0.35) = 0.059(5.9\%)$$

2. Cost of Preference Capital

It is also an explicit cost as the rate of dividend is fixed and known. But, dividend paid is not tax deductible so there is no tax shield here.

$$\textit{Cost of Preference } (kp) = \frac{\text{D}}{\text{NP}}$$

Here, D = Preference dividend

NP = Sale proceeds of preference (Par value − discount + premium − floatation cost)

Example

A company raises preference share capital for perpetuity of 1, 00,000 by issue of 10% preference shares of Rs. 10 each. The company is in 35% tax bracket. Calculate the cost of preference capital when they are issued at (i) par, (ii) 10% discount, and (iii) 10% premium

Solution:

1. Issued at par

$$Kp = \frac{\text{D}}{\text{NP}} = \frac{1}{10} = 0.1(10\%)$$

2. Issued at discount

$$Kp = \frac{\text{D}}{\text{NP}} = \frac{1}{9} = 0.11(11\%)$$

3. Issued at premium

$$Kp = \frac{D}{NP} = \frac{1}{11} = 0.009\,(9.09\%)$$

3. *Cost of Equity Capital*

It is an implicit cost as there is no assured/coupon rate of return involved here. Cost of equity capital (COEC) is the rate of return that the firm must earn to meet shareholders' expectations and thereby increase shareholders' wealth. It is usually calculated by c*apital asset pricing method (*CAPM).

Capital Asset Pricing Method (CAPM)

a. It is the most widely used approach to calculate cost of equity.
b. It describes the "*risk-return"* trade-off for securities.
c. It is based on certain assumptions:
   (i) the efficiency of the security markets; and
   (ii) investors' preferences

Types of Investment Risks:

1. Diversifiable/Unsystematic risk/Specific risk (like management policies, strikes)
2. Nondiversifiable/Systematic risk / Market risk (like interest rate changes, inflation)

The only risk that the investors are sensitive to is the "systematic risk." So, measurement of nondiversifiable/systematic risk is relevant for an investment decision making.

Measurement of non diversifiable risk/systematic risk

According to CAPM, nondiversifiable risk of an investment/security is measured by "beta" *coefficient*.

"**Beta**" (β) is a measure of the volatility or sensitivity of a security's Return (capital gains plus dividend) in relation to changes in the returns of the overall capital or stock market.

So, risk of an individual security is the "Volatility of the security return vis-à-vis the return of the market portfolio."

Categories of Beta:

1. Aggressive beta: Shares with a beta more than 1 and are more risky.
2. Average/Neutral beta: Shares with a beta equal to 1.
3. Defensive beta: Shares with a beta less than 1 are less risky.

CAPM Equation:

$$ke = Rf + b(km - Rf)$$

Here,

ke = Cost of equity capital

Rf = the risk free rate of return

km = Expected market return, that is, return expected on the market portfolio of shares

$km - Rf$ = risk premium (difference between expected market return and risk free rate of return)

b = beta of the firm's share (systematic risk of an equity share in relation to the market)

Calculation of Beta:

$$\beta_j = \frac{\text{Covariance } jm}{\text{Variance } m}$$

= Co-movements of individual stock and market Index volatility

$$\beta_j = \frac{\text{Covar}_{j,m}}{\sigma_m^2}$$

$$= \frac{\sigma_j \sigma_m \text{Cor}_{j,m}}{\sigma_m \times \sigma_m} = \frac{\sigma_j}{\sigma_m} \times \text{Cor}_{j,m}$$

Example

The financial manager of Enterprising ventures wishes to use the CAPM to determine the firm's cost of equity capital. The investment bank of the firms provides the following information regarding the same:

Risk free rate is currently 6 percent
Market return is 12 percent
Firm's beta is 1.4

Solution:

$$\begin{aligned} Ke &= Rf + \beta(Km - Rf) \\ &= 6\% + 1.4(12\% - 6\%) \\ &= 6\% + 1.4(6\%) \\ &= 14.4\% \end{aligned}$$

4. Cost of Retained Earnings

It is also an implicit cost with no explicit obligation to pay a return.

Cost of retained earnings is the re-earning foregone by the shareholders. In other words, the cost of retained earnings is *the opportunity cost* of retained earnings.

So, $kr = ke$

II. Assigning Weights to Specific Costs

This involves determination of the proportion of each source of fund in the total capital structure of the company.

Weights here may be either:

(a) Historical weights (for existing capital structure).

Here, actual/target capital structure proportion is the basis.

(i) book value, or

(ii) market value weights.

Market value weights are preferred over book value weights.

(b) Marginal weights (for new capital structure).

The proportion of each type of capital to be raised is the basis here.

III. Multiply Specific Costs With Weights to Get Total Cost

Weighted Average Cost of Capital (WACC)

$$ko = \sum wiki$$
$$ko = kd(1 - T)wd + kewe + kpwp$$

Here, ko = WACC

wd,we,wp = weights of each source in the capital structure

Case let 1

From the following capital structure of a company, calculate the overall cost of capital using (a) book value weights, and (b) market value weights:

Source	Book Value (Rs.)	Market Value (Rs.)
Equity Share Capital (Rs. 10 shares)	45,000	90,000
Retained Earnings	15,000	
Preference Share Capital	10,000	10,000
Debentures	30,000	30,000

The after-tax cost of different sources of finance is as follows:

Equity Share Capital: 14%; Retained Earnings: 13%; Preference Share Capital:10%; Debentures: 5%.

Solution:

(a) WACC (Book Value Weights)

Source (1)	Amount (Rs.) (2)	Proportion (3)	After Tax (4)	Weighted Cost (3) × (4)
Equity Share Capital	45,000	0.45	14%	6.30%

Source (1)	Amount (Rs.) (2)	Proportion (3)	After Tax (4)	Weighted Cost (3) × (4)
Retained Earnings	15,000	0.15	13%	1.95%
Preference Share Capital	10,000	0.10	10%	1.00%
Debentures	30,000	0.30	5%	1.50%
	100,000			10.75%

So, WACC (*Ko*) = 10.75%

(b) WACC (Market Value Weights)

Source (1)	Amount (Rs.) (2)	Proportion (3)	After Tax (4)	Weighted Cost (3) × (4)
Equity Share Capital	90,000	0.692	14%	9.688%
Preference Share Capital	10,000	0.077	10%	0.770%
Debentures	30,000	0.231	5%	1.155%
	1,30,000			11.613%

So, WACC (*Ko*) = 11.613 %

Case let 2

There is a project requiring an investment of Rs. 5,00,000. The company is proposing to finance it with Rs. 4 lacs of debt and Rs. 1 lac of retained earnings. The effective cost of debt is 8% and cost of equity is 15%.

From the above information, calculate the overall cost of capital

Solution:

WACC (Book Value Weights)

Source (1)	**Amount (Rs.) (2)**	**Weights (3)**	**After Tax (4)**	**Weighted Cost (3) × (4)**
Debt Capital	4,00,000	0.8	8%	6.4%
Retained Earnings	1,00,000	0.2	17%	3.4%
	5,00,000			9.8%

So, WACC(Ko) = 9.8%.

SECTION 5

International Perspective

CHAPTER 12

Capital Budgeting for the Multinational Firms

The Present Chapter

It discusses the capital investment practices at the international level.

Introduction

Foreign-exchange rates, interest rates, and inflation are three external factors that affect multinational companies (MNCs) and their markets. They are particularly useful for evaluating international capital budgeting decisions. Foreign-exchange rates have the most significant effect on the capital budgeting process. A foreign investment project will be affected by exchange rate fluctuations during the life of the project. But, these fluctuations are difficult to forecast. Therefore, correct hedging methods need to be used to incorporate these changes. The cost of capital is used as a cut-off point to accept or reject a proposed project. Since, the cost of capital is the weighted average cost of debt and equity; interest rates also play a key role in a capital expenditure analysis. Most components of project cash flows—revenues, variable costs, and fixed costs—rise in line with inflation. Hence, a capital expenditure analysis requires price projections for the entire life of the project.

The investment decision in a foreign country is the outcome of combination of strategic, behavioral and economic considerations. The choice of a specific project within a particular market requires an evaluation of its economic

feasibility. For an MNC, capital budgeting involves economic analysis of the firm's investment opportunities and its survival and sustainability depends on the most profitable investment opportunity. Correct use of capital budgeting techniques can help the firm in identifying the international projects worthy of implementation from those that are not. Capital budgeting for an MNC is complicated because of the complexity of cash flows and financing options available to the MNC.

Factors Affecting Foreign Capital Investment

Multinational capital budgeting is considerably more complex as compared to domestic investment due to a number of factors that need to be considered. These factors are as follows:

1. Terminal Values

Terminal values of long-term projects are always difficult to estimate, they become far more difficult in the multinational context due to the added complexity of the factors, such as divergent perspectives on the value of acquiring the assets. This is particularly relevant if the assets are located in a country that is economically segmented due to cross-border restrictions on the flow of physical or financial assets.

2. Discount Rate

The higher discount rate is set up for capturing the additional uncertainties arising from exchange risk, political risk, inflation, and such factors. For making these adjustments, multinational firms use wide-ranging publicly available data, historical analysis, and professional advice to make reasonable decisions.

3. Financing versus Operating Cash Flows

In multinational investment projects, the type of financing is very critical in deciding the attractiveness of projects to the parent company. Thus, cash may flow back to the parent because the project is structured to

generate such flows via royalties, licensing fees, dividends, and so on. Unlike domestic capital budgeting, operating cash flows cannot be kept separate from financing decisions.

4. Parent versus Project Cash Flows

Parent (home country) cash flows must be distinguished from project (host country) cash flows. While parent cash flows reflect all cash flow consequences for the consolidated entity, project cash flows look only at the single country where the project is located.

5. Foreign Currency Fluctuations

Another added complexity in multinational capital budgeting is the significant effect that fluctuating exchange rates can have on the prospective cash flows generated by the investment. From the parent's perspective, future cash flows abroad have value only in terms of the exchange rate at the date of decision. In conducting the analysis, it is necessary to forecast future exchange rates and to conduct sensitivity analysis of the project's viability under various exchange rate scenarios.

6. Long-term Inflation Rates

Differing rates of national inflation and their potential effect on competitiveness must be considered. Inflation will have the following effects on the value of the project: (a) it will impact on the local operating cash flows, both in terms of the prices of inputs and on the sales value; (b) it will impact on the parent's cash flow by affecting the foreign-exchange rates, and (c) it will affect the real cost of financing choices between foreign and domestic sources of capital.

7. Relevant Cash Flows

They are the dividends and royalties that are passed from each subsidiary to a parent firm. As these net cash flows must be converted into the currency of a parent company, they are subject to future exchange

rate changes. Moreover, foreign investment projects are subject to political risks such as exchange controls and discrimination. Normally, the cost of capital for a foreign project is higher than that for a similar domestic project due to two major risks of political risk and exchange risk.

8. *Subsidized Financing*

In situations where a host government provides subsidized project-financing at below-market rates, the value of that subsidy must be explicitly considered in the capital budgeting analysis. If a company uses the subsidized rates in the analysis, there is an implicit assumption that the subsidy will exist through the life of the project.

9. *Political Risk*

This is another factor that can significantly impact on the viability and profitability of foreign projects. Changes in a country's government, its policies can affect the climate in that country toward foreign investors and investments. This can affect the future cash flows of a project in that country in a variety of ways.

Process of Evaluating Foreign Projects

The basic principles of analysis are same for foreign and domestic investment projects. However, a foreign investment decision results from a complex process, which differs in many aspects, from the domestic investment decision on account of multiple factors as discussed above.

The foreign investment decision-making process involves following phases:

1. Foreign Investment Search

The availability of good investment opportunities lays down the foundation for a successful investment project. Therefore, a system should be established to stimulate ideas for capital expenditures abroad and to identify good investment opportunities. The foreign investment largely

depends on the economic and political forces in the host country. Foreign investment is explored by the companies for number of reasons, like identifying new markets, production efficiency, and so on. Considerations such as profit opportunities, tax policy, and diversification strategies are economic variables that may affect a decision of foreign investment.

2. Exploring the Political Climate

Political risks exist for the domestic investment in the form of price controls, regulation of some industries or imposition of limits and tariffs on key components. These political risks are certainly more in foreign investment. Since, two national governments become involved in a foreign investment project—that of the home country of the parent company and of the host country of the subsidiary. The goals of the two countries may differ; laws may change; capital options may be limited.

One major concern of MNCs is that the political climate of a host country may not remain favorable. Therefore, the multinational financial manager must analyze the political environment of the proposed host country and determine whether the economic environment would be conducive to the proposed project. In general, projects aimed at reducing the country's need for imports and thus, saving foreign exchange is given the highest priority by the host government.

3. Evaluation of the Company's Overall Strategy

If the political climate is found to be favorable, the MNCs move on to the next stage of the decision-making process. The analyst then assesses the usefulness of each alternative within the company's overall strategy to determine how foreign operations may affect company's current position. At this stage, the company must check whether the project conflicts with company goals, policies, and resources. The analyst must also evaluate whether the company has the experience to handle the project and how the project could be integrated into existing projects.

If a particular set of policies is not consistent with the stated objectives, either the policies or the objectives should be revised. The company must also have resources necessary to carry out its policies. If resources are not available, the necessary arrangement should be done to acquire them.

4. Cash Flow Analysis

The next stage of the screening process involves a standard cash flow analysis. The after-tax cash outflows and inflows directly associated with each project must be estimated to evaluate capital investment alternatives. An MNC must forecast its expected expenditures for the proposed project. The major difference in the application of cash flow analysis for foreign investment is that a company must make two sets of cash flow analyses, one for the project itself and one for the parent company. It comprises of following steps:

(a) *The Demand forecast.* The first step in analyzing cash flows for any investment proposal is a forecast of demand. This forecast depends on factors, like population, income, competition, and general economic conditions. The market size in the investment decision-making process is very important because the expected market size can be used as an indication of profit possibilities for the proposed investment project.

(b) *Duties and taxes.* A foreign investment cuts across national boundaries, therefore an MNC must review the tax structure of the host country. The evaluator should define the entity, statutory tax rates, tax treaties, treatment of dual taxation, and tax incentive programs. The MNC should also know whether the host government imposes customs duties on imported production equipment and materials not obtainable from local sources.

(c) *Foreign-exchange rates*. Another important feature of foreign investment analysis is that project inflows available to the investor are subject to foreign-exchange rates and restrictions. So, if the exchange rate is expected to change or allowed to float, cash flow analysis becomes more complicated. This factor should be duly considered. It is equally important to recognize that many host governments have various exchange control regulations. Under these regulations, permission may be required to buy foreign exchange with local currency for payment of loan interest, management fees, royalties, and billings for services provided by foreign suppliers.

(d) *Project vs. Parent cash flows.* Project cash flows and parent cash flows can be substantially different due to tax regulations and exchange

controls. Moreover, some project expenses, such as management fees and royalties, are returns to the parent company. In general, incremental cash flows to the parent company are relevant. Hence, the MNC must analyze the impact of taxation, exchange controls, and other operational restrictions on cash flows to the parent company.

5. Determination of the Cost of capital

The cost of capital is extremely important in a foreign investment as it acts as a major link between the firm's foreign investment decision and the wealth of the owners in the global market. It is the deciding factor whether proposed foreign investment will increase or decrease the firm's stock price. Clearly, only the projects expected to increase stock price would be accepted. That's why, various financing options available for the project are evaluated in terms of cost factor and then an optimal capital structure is arrived at.

Example

The Newtech Company plans to establish a subsidiary in Japan to manufacture and sell readymade shirts. The company has total assets of $70 million, of which $45 million is equity financed. The remaining is financed with debt. The construction cost of the Japanese facility is estimated at Yen 2,400,000,000, of which Yen 1,800,000,000 is to be financed at a below-market borrowing rate arranged by the Japanese government.

What amount of debt the company should use in calculating *the* tax shields on interest payments in its capital budgeting analysis?

Solution:

The Newtech Company has an optimal debt ratio of .357 (= $25 million debt/$70 million assets) or 35.7%. First we find the bound charge densities

The project debt ratio is .75 (= Yen1,800/Yen2,400) or 75%.

The company will overstate the tax shield on interest payments if it uses the 75% figure because the proposed project will only increase borrowing capacity by Yen 856,800,000 (= Yen2,400,000,000 × .357)

6. Economic Evaluation

Once cash flows and the required rate of return have been determined, the company begins the formal process of evaluating investment projects. There are many techniques for evaluating projects under conditions of certainty. The four most commonly used methods for an economic evaluation of individual projects are payback, average rate of return, internal rate of return, and net present value.

7. Selection of the Project

A project will be selected if it clears the evaluation criteria as discussed above. The final selection of projects also depends on capital rationing decision.

8. Risk Analysis

All foreign investment projects are subject to various risks—business and financial risks, inflation and currency risks, and political risks. These risks may have an adverse impact on the financial outcome of a particular project. Furthermore, the risks vary widely from country to country. Therefore, their incorporation in the foreign projects is necessary for the success of the project. Many MNCs use the risk-adjusted discount rate and the certainty equivalent approach to adjust for project estimates.

9. Implementation

At this stage, the project is finally executed. Capital expenditure is done in accordance with formal procedures. These procedures include the use of standard forms, the channels for submission and review, and the resource requirements and limits for approval.

10. Post Audit

It includes both control and post review. Cost control of a foreign project is a major challenge here. The process is monitored to ensure that project

is completed within the established guidelines. This phase is particularly important for foreign investment projects, because operations are supervised from a distance.

Since, multinational capital budgeting decisions are made on the basis of assumptions in foreign countries, estimates and actual results may differ. Thus, when a foreign project is completed, the firm should perform a post audit on the entire project to determine its success or failure. The results of post audits enable the firm to compare the actual performance of a foreign project with established standards. If the capital budgeting process used by an MNC has been successful, the system is likely to be reinforced. If the system has been unsatisfactory, it is likely to be revised or replaced for future foreign projects.

Key Issues in Foreign Capital Investmnet

Following are the key considerations which are relevant in a multinational capital investment decision.

1. Should MNCs use forward rate to estimate dollar cash flows of foreign projects?

An MNC should use the forward rate if it plans to hedge its net cash flows in future periods. Of course, it must also consider the possibility of over hedging its future net cash flows in foreign currencies if it uses this strategy. When it assesses a project and does not hedge, it should use its expected spot rates. However, it should compare its expected spot rates to the forward rates and assess whether there are any large deviations of its expectations from the forward rate which are worth considering.

2. Why should capital budgeting for subsidiary projects be assessed from the parent's perspective?

When a parent allocates funds for a project, it should view the project's feasibility from its own perspective. It is possible that a project could be feasible from a subsidiary's perspective but be infeasible when considering a parent's perspective (due to foreign taxes or exchange rate changes affecting funds remitted to the parent).

3. How future change in the currency of Project country will likely affect the value (from the parent's perspective) of a project established by a Parent country MNC?

> *Example: How future appreciation of the euro will likely affect the value (from the parent's perspective) of a project established in Germany today by a U.S.-based MNC?*

Future appreciation of the euro would benefit the parent since the euro earnings would be worth more when remitted and converted to dollars. This is especially true when a large percentage of earnings are sent to the parent.

4. What is the feasibility of the project proposed to be bought by a MNC in a foreign country?

> *Example: Hasy Industries, a U.S.-based MNC, considers purchasing a small manufacturing French company operating only within France. Would the proposed be feasible?*

The proposed acquisition is likely to be more feasible if the euro is expected to appreciate over the long run. Hasy would like to purchase the firm when the euro is weak. Then, after the purchase, a strengthened euro will convert the French firm's earnings remitted to the parent into a larger amount of U.S. dollars.

CHAPTER 13

Post Completion Auditing of Capital Budgeting Decision

The Present Chapter
It discusses why and how of post completing auditing of capital investment decisions.

Introduction

Post completion audit aims to evaluate the efficiency and effectiveness of the capital budgeting decision that the management has implemented. Post completion auditing (PCA) of capital investments is a formal process that checks the outcomes of individual investment projects after the initial investment is completed and the project is operational.[1] PCA is one formal control system that is a part of the company's total management control system for effective delivery of projects in future.

Features of PCA

Following are the characteristics of PCA:

1. It is a formal review of a completed investment project.

[1]Chenhall, R.H., and Morris, D. "The Role of Post Completion Audits, Managerial Learning, Environmental Uncertainty and Performance," *Behavioral Research in Accounting* 5, (1993): 171–86.

2. It takes place after an investment has been completed and has started generating cash flows.
3. It compares the budgeted figures of an investment project and the actual figures/achievements after completion.
4. It is a regular monitoring process of capital projects.

Importance of PCA

A post completion audit assesses the efficiency and effectiveness of a capital budgeting decision. It focuses on the future outcome of the project and provides a ground for improvement of projects.

1. *Improved returns*. PCA will monitor the budgeted and actual position of project, analyze the deficiencies and find the ways to improve the project returns.
2. *Direction*. It finds out on the reasons for the existence of problems and guides managers to identify the cause of the problems for other projects.
3. *Corrective actions*. It serves as a basis for the identification of the need for and the implementation of corrective actions.
4. *Future viability*. It necessitates re-evaluation of the project, incorporating the changes for the future outcome of the project.
5. *Better implementation*. It determines the over/under performance of a given project in terms of internal and external factors and helps in achieving more positive results in the implementation of future projects.
6. *Improve forecasts*. Individuals become more diligent when they know their results will be compared. So, when actions are monitored, biases are observed and eliminated; new techniques incorporated result in better forecasting.
7. *Improved operations*. When a division has made a forecast and undertaken a project, their reputation is at risk. If costs are above projections and sales are below projection, the division can and will make an effort to bring the results into line with the forecasts.
8. *Better control systems*. It improves the management control of projects. The post completion review guides managers to nail the problems well in time for projects.

Process of Post Completion Review

A successful post completion review is based on the complete data network that is operational from the first stage of the capital budgeting analysis. The process of post completion review consists of the following steps:

1. Deciding the Post Completion Review

The decision to carry out a post completion review is normally made before the project is carried on. An appropriate information system should be set up from the beginning to assure that the information needed for a proper review is available as the project progresses. Generally, post completion reviews are performed on projects or parts of projects that are likely to be repeated in future.

Post completion reviews should be a regular part of management. A review should be carried out regularly on all significant capital investment projects and on all decisions affecting the strategy of the business. It should reinforce the link between the past and the future results for the managers.

2. Defining the Scope and Purpose

The main purpose of a post completion review is to contribute to the success of capital budgeting decisions. It involves the systematic monitoring and providing feedback on the performance of past actions in planning or implementation. It must encompass the review of all facts and figures about markets, technology, personnel, environment, competition, cost of capital, and so on that were made during the decision-making period. It should focus both on the prior assumptions and on the actual outcome.

A post completion review must ask questions: Why? and How? For instance, why has the project been successful or Why it has been unsuccessful? Why have problems arisen during the decision and implementation process? How did we overcome these problems? How can we make sure these problems do not arise in future?

3. Choice of the Projects to Review

Necessary care should be given to the choice of the projects that will be reviewed. The criteria used in the cost benefit decision to implement or reject the completion review are specific to each firm and may differ depending on the importance, the purpose and the nature of the project.

Three categories of criteria are:

a. Significance of projects;
b. Objectives of the project; and
c. Nature of the project.

4. Setting of Post Completion Review Committee

The post completion review should be carried out by a committee composed of persons who are experienced in or familiar with the firm's capital expenditure control system and have the required know-how of the processes used in assessing the implementation of the project and its outcome. Since the scope of a post completion review extends beyond financial information, internal auditor or financial officer serving on a post completion review committee should perform his function in view of managerial perspective. In small organizations or for small projects, the post completion review can be carried out by one individual.

5. Laying Down the Methodology of Post Completion Review

The financial impact of capital expenditure of an enterprise is generally seen over several years. Therefore, correct methodology for review of the project is must for testing its effectiveness. The type of methodology to be used depends upon the kind of post review.

There are two types of post completion reviews:

a. An *"investment" post completion review* takes place immediately after the completion of the investment. Its purpose is to focus (1) on how the project was carried out, (2) on a comparison between forecasted and actual expenditures, and (3) on a comparison between forecasted and actual project capabilities.

b. An *"outcome" post completion review* can take place at any time during the life of the outcome of the project. Its purpose is to focus on a comparison between the forecasted and actual outcomes, between the assumptions and the actuals.

Post Completion Review Check List

Following is the probable list of questions in a post completion review. This list is more or less standard. But, every organization would have to adapt this list to fit its needs and resources while keeping the spirit of the process.

A. Questions Related to Decision Making:

- How was the project selected?
- What were the parameters used for selection of the project?
- What were the techniques applied for the selection of the project?
- Who was the Project Manager?
- How were the data selected for this assessment?
- Was a risk analysis carried out for the project? If yes, how and why?
- What information was analyzed in arriving at this decision? Could the decision have been different if more information had been provided for the assessment?
- Has the project's strategic role within the company been clearly and formally presented?
- What are the major factors contributing to the actual results?
- Are these details required for all capital expenditures?

B. Questions on Planning and Budgeting:

Planning

- Was the purpose of the project clearly identified?
- Were responsibilities for the project clearly established?

- Was a necessary cost accounting system designed appropriate to the project's methods?
- Was an implementation plan established for specific activities with predetermined resource constraints?
- Were contingency plans identified?

Budgeting

- Have the most effective budgeting methods been used for the project?
- Was information on resource costs taken from reliable sources?
- Were forecasted inflation rates based on realistic assumptions?
- Were the reserves for contingencies determined after careful consideration?
- Was information on actual expenditure available on a timely basis?
- Was a performance review system put in place?
- Were progress reports available on a timely basis?

C. *Questions Related to Performance and Outcome:*

Analysis

- Was the project evaluated for the objectives being set?
- Have significant variances been analyzed properly?
- Have the reasons for cost and other variances been analyzed and interpreted for necessary actions?
- Have steps been taken for the formulation of a corrective action plan?

Control

- Have major changes in the strategy been done after a careful review of options?
- Have prompt control measures been taken?
- Have the funds allocated to the project been properly disbursed?

- Were performance variances and the corrective actions fully implemented?

Future Implication

- Did the reports submitted to senior executives on time?
- Did the reports help the individuals in charge to make their decisions?
- Did the results provide a platform for future viability of the projects?

Case Example

KMA D2 Evaluate Project Completion Review

This is an example of PCR KMA of Australian Government for ensuring Occupational Health and Safety (OHS) continues for the whole life of the facility and for the improved planning of future projects.

Action	Undertake a safety review of the building to identify any hazards requiring rectification prior to occupation.
Phases	• Phase 9—Operation and maintenance.
Description	Before users occupy a building, a review of the completed structure should be undertaken against the specifications. Installation of any finishes completed earlier in the project should be inspected to ensure integrity has been maintained. Receipt of a Certificate of Occupancy is not confirmation that the building does not contain any safety hazards and should not be the sole confirmation of a successful post construction review. In addition to reviewing the completed building, the opportunity to identify safety issues that did not present themselves at the design or construction stages can be captured. A robust risk management approach should be applied to this post occupancy review. Any risks identified should be subject to rigorous assessment and strategies developed to reduce these risks as much as possible. Residual risks should be recorded in the project risk register and requirements for ongoing monitoring or further review should be documented.

Key Benefits	• Proactive OHS risk mitigation strategy.
Desirable Outcomes	• Gathering of information with the aim of providing a facility with minimal safety hazards to the end users prior to occupation. • Sharing the outcomes of the hazard identification with other government agencies via a common database.
Performance Measure	• All the identified safety hazards are recorded in the project risk register. The risk register must be continually monitored and maintained. • An assessment of the building is to be conducted prior to hand over of the building to the agency

Source: http://www.fsc.gov.au/sites/FSC/Resources/AZ/Documents/Booklet%205%20Completion%20Stage.pdf. Accessed August 20, 2014.

CHAPTER 14

Capital Investment Issues and Challenges

The Present Chapter

It discusses the various issues and challenges which are faced by the businesses while taking capital investment decisions.

Introduction

Capital budgeting would be easy in a world without agency and information problems. The decision maker would simply calculate a project's IRR and compare it to the cost of capital. But in reality, these problems are inevitable because funds providers for investment have to must rely on management (agents) to identify and invest in long-term projects for expected returns. As a result, the quality of capital allocation depends on how effective the decision process is by way of agency function.

Various decision procedures are employed in practice by business organizations: some decisions are fully delegated to divisions (typically, expansion of an existing plant); some decisions require approval of headquarters (typically, construction of a new plant); and other decisions require approval according to the nature of the proposal, depending on the amount of funding required for the investment.

In recent years, numerous companies have realized record losses and have been forced to lay off thousands of workers due to poor financial markets and conditions, even filing bankruptcy in some cases. This has been mostly on account of the inability of organizations to forecast and

control costs effectively. They have not been able to manage well major capital expenditure.

As a result, the key questions emerge out: What tools/technologies is the company employing to meet its forecasts and expectations? Is the organization monitoring its costs regularly? What are the potential risks in the company for capital expenditures? How are these risks being assessed, managed and controlled?

These are among many questions that companies face from investors, employees, and other stakeholders. There are a variety of reasons and drivers, some of which are beyond a company's direct control:

- Lack of ability to accurately forecast supply and demand
- Internal cost misallocations
- Insurance, litigation and regulatory costs
- Commodity prices
- Environmental costs
- Natural calamities

Key Issues

Capital investment decisions mostly are regulated by the government policies and procedures. The company has to decide as to which of the given capital investments would ensure the maximum value to their business. Therefore, capital investment decisions suffer from multiple constraints.

The *amount of capital* raised by the organization can be restricted and thus it puts a restraint on the firms' choice, among several project investments. If the firms' debt is raised, the firms' debt-equity ratio is increased which increases the risk of a business.

Selection of a suitable *project appraisal technique* could be a problem. Strategic capital investment decisions require capital investment appraisal techniques which help in rational decision-making and increasing the firm's overall value. In a lot of cases, capital investment decisions are reached subjectively and financial techniques are applied, once the capital investment decision has been made.

Most of the investment projects have *strategic problems* which are ill-structured and complex. It's important to recognize them well in time and put the strategies in place to deal with such issues and problems because one wrong capital investment decision will impact a business's value negatively.

The *project ranking* plays a crucial role in capital investment decisions. Depending upon the kind of project, the companies prioritize the various projects. Project ranking is dependent on the fact of risk-return trade and the ability of the project to provide the business, a maximum value.

A lot of capital investment decisions are affected by the *internal working conditions* within an organization. The political activity inside an organization might affect a capital investment decision, where individuals or groups have a set interest in certain projects.

Thus, the capital investment decisions are not affected by one component because the problem of investment is not just about replacing old equipment with new, but it's related to replacing an existent procedure within a system with a new one to make the whole system better and much more effective. These are some of the factors which affect capital investment decisions:

Future Challenges

In today's time and business environment access to capital is becoming tougher to obtain and therefore management must control costs to sustain a competitive advantage, because every penny counts. Organizations across the globe are becoming smarter about how they utilize their capital by focusing on cutting costs and spending money in areas where the return on investment (ROI) is the greatest.

Following are the challenges that companies will face in generating and exploiting investment opportunities over the next few years:

1. Investment is the activity that leads to capital formation and is an important contributor to economic growth. The one important theme that underlines the investment policy environment that companies will face is the *increased level of factor mobility* and international integration that world markets are experiencing. The

investment decisions made by corporations and the policy decisions made by government must deal with the problems and opportunities that globalization implies. *The companies should make the necessary infrastructure investments needed to maintain a high quality of life and to increase the efficiency of capital and labor.*

2. In most cases, investment decisions are made by corporate responding to *market signals*. It is not likely that this strategy will always be successful in the future. *For instance,* efforts to stimulate R&D investment have failed in many cases and companies have slowed down to invest in new technologies. Furthermore, encouraging a specific sector has might run into challenges from our trading partners. *The challenge is to develop new ways of supporting investment by more international policy coordination, regulation, and public investment.*
3. *Environmental issues* and their impact on investment decisions will increase in importance and complexity at the country level. The policy problem is how to support private sector investment and implement social choices at the same time. *The challenge is to ensure that firms have a competitive cost base while simultaneously ensuring that Country's social objectives are being met.*
4. The specific problems of *low investment* and slow channelizing of resources is all about the way in which Companies' manage their investment opportunities. There is concern that there might be underinvestment in long-term, risky projects on account of risk-averse attitude of investors. This is inconsistent with the diversification opportunities for the businesses, both domestic and international. *The challenge is to increase competitive pressure on companies so that they will be induced to pursue valuable investment opportunities vigorously.*
5. Corporate decision making is, to large extent, influenced by the *regulation of financial markets*. For instance, bank loans are a significant channel of mobilizing funds but bank lending can be distorted through deposit insurance regulations. *The challenge is to implement a system that regularly evaluates and improves the regulation of financial markets.*

So, the companies can benefit from deploying best practices to forecast cost and manage capital expenditures. Such practices include the following:

- Ensure centralized reporting for all business units/entities.
- Utilize full project work capacity.
- Ensure all capital-intensive projects are duly forecast.
- Revise and update schedules regularly based on level of completion.
- Monitor capex on timely basis to mitigate the probable risks.
- Ensure proper actions are being taken so that deviations are rectified accurately.

SECTION 6

Case Studies

CHAPTER 15

Capital Budgeting Practice of Reliance Industries Ltd

The Present Chapter

It discusses the investment decision made by the business enterprises on a case basis of India's largest private sector enterprise, Reliance Industries Ltd. It contains an examination of the fixed assets structure to see the level of investment made in fixed assets and explains how the different units finance their respective assets. The chapter also includes a discussion on the utilization of fixed assets and depreciation policy followed by the business units.

Introduction

As discussed in the previous sections, once the required amount of funds (finances) is available then the next important task of the finance manager is the efficient allocation of those funds among long-term assets in such a way so as to assure maximum return on it. So, the capital investment decision is the most important decision in a business organization.

Reliance Industries Ltd. (RIL)

The Reliance Group is India's largest private sector enterprise, with businesses in the energy and materials segment. Group's annual revenues are over US$ 66 billion. The flagship company, *Reliance Industries Limited,* is a Fortune Global 500 company and is the largest private sector company in India.

It started with textiles in the late seventies, and then pursued a strategy of backward vertical integration—in polyester, fiber intermediates, plastics, petrochemicals, petroleum refining and oil and gas exploration, and production—to be fully integrated along the materials and energy value chain.

Reliance enjoys global leadership in its businesses, being the largest polyester yarn and fiber producer in the world and among the top five to ten producers in the world in major petrochemical products.[1]

Fixed Assets Management

The management of fixed assets involves generally following four aspects:

a. level of investment in fixed assets;
b. financing pattern of fixed assets;
c. utilization of fixed assets, and
d. adequacy of depreciation.

Here is a discussion regarding theoretical consideration and actual practice of the unit under study on these aspects.

A. *Level of Investment in Fixed Assets*

The investment in fixed assets involves application of funds for longer periods into the future and being in large increments, these are generally difficult and costly to reverse. So, the investment decision in fixed assets should be taken by a finance manager after a careful consideration of several factors, such as the amount of investment required capital budgeting techniques, nature and size of the business, recommendations of chief engineer and technical staff, guidelines issued by various committees appointed by the government or some national or international bodies like Chamber of Commerce, and so on. and the prevailing practices in other companies. Generally, fixed assets constitute 50 percent of the investment in total assets of a concern. The analysis of the level of investment in fixed assets of RIL is hereby follows in table 15.1.

[1]http://www.ril.com/html/aboutus/aboutus.html Accessed on May 7, 2014.

Table 15.1 Fixed Assets' Outlay of RIL (2011-12 to 2013-14)

			(Rs. in million)
Particulars	**2011-12**	**2012-13**	**2013-14**
Total Assets	**2,951,400 (100.00)**	**3,185,110 (100.00)**	**3,675,830 (100.00)**
Fixed Assets / Non- Current Assets			
Tangible Assets	880,010 (54.06)	829,620 (47.53	804,240 (34.63)
Intangible Assets	257,220 (15.80)	267,860 (15.35)	289,820 (12.48)
Capital Work-in-Progress	36,950 (2.27)	135,250 (7.75)	326,730 (14.07)
Intangible Assets under Development	40,590 (2.49)	55,910 (3.20)	90,430 (3.89)
Non-Current Investments	269,790 (16.57)	241,430 (13.83)	526,920 (22.69)
Long Term Loans and Advances	143,400 (8.81)	215,280 (12.33)	284,360 (12.24)
Total Fixed Assets / Non-Current Assets	1,627,960 (55.16)	1,745,350 (54.80)	2,322,500 (63.18)

Source: http://www.ril.com.

The table indicates that the share of investment in fixed assets has been showing a fluctuating trend over all these years, ranging from 2011–12 to 2013–14. It has declined and improved from time to time. The share of gross block in the total assets is on a continuous declining side during the period. It declined from 54.06 percent in 2011–12 to 34.63 percent in 2013–14. Now, the share of total fixed assets almost followed a zig-zag pattern of change during the respective period. It decreased from 55.16 percent in 2011–12 to 54.80 percent in 2012–13 and then increased to 63.18 percent in 2013–14.

The ups and downs in the size of fixed assets indicate that the management takes care to adjust the assets according to the needs of the undertaking. But, on the whole, the position of fixed assets is not very satisfying as fixed assets form just around 55 percent of total assets of the concern and RIL is a manufacturing company. In a manufacturing sector, fixed assets ideally should be around 70 percent of the total assets. So, taking

into consideration the two facts, that is, the overall share of the fixed assets in the total assets of the undertaking on one hand and to maintain the steady growth in operational activities and sales on the other, it is suggested that it would be better to invest a little more in fixed assets.

B. Financing Pattern of Fixed Assets

Fixed assets have to be primarily financed by the proprietors of the enterprise. The funds provided by the owners should be sufficient not only to finance the entire amount of fixed assets required but also the current assets of permanent nature. If the owners' funds are not sufficient enough, the other long-term funds may be used to finance the fixed assets. So, it is clear that short-term funds, in every circumstance, should be avoided to finance the fixed assets. Following ratios are used to analyze the financing pattern of fixed assets:

(i) fixed assets to net worth ratio, and
(ii) fixed assets to long-term funds ratio.

1. Fixed Assets to Net Worth Ratio

This ratio is used to describe the relationship between fixed assets and net worth. Net worth means the sum total of equity share capital, preference share capital, and reserves and surplus. It also indicates the margin of safety for long-term creditors. It is computed as:

$$\text{Fixed Assets to Net Worth Ratio} = \frac{\text{Fixed Assets}}{\text{Net Worth}}$$

If the ratio is less than 1, it means that the net worth is more than fixed assets. So, there is a margin of safety for long-term creditors. It also means that the working capital is being financed partly out of the shareholders' funds. Conversely, if the ratio is more than 1 then it indicates that fixed assets are also financed by long-term debt and so margin of safety for the creditors is low. Also, no net worth is there to finance the working capital requirements. A ratio less than unity is treated as an ideal one. Table 15.2 contains the fixed assets to net worth ratio pertaining to RIL under study for the period 2011–12 to 2013–14.

Table 15.2 Fixed Assets to NET Worth Ratio of RIL (2011-12 to 2013-14)

				(In Nos. of Times)
Year	**2011-12**	**2012-13**	**2013-14**	
Fixed Assets to Net Worth Ratio	0.98	0.97	1.18	
X				1.04
C.V				11.35

Source: Computed based on Annual Reports of RIL.

A close look into the table reveals that RIL is in a quite promising state of affairs regarding using the net worth for financing the fixed assets. It has registered the average fixed assets to net worth ratio of mere 1.04. The ratio varies from 0.97 in 2012–13 to 1.18 in 2013–14, showing a fluctuating trend during the period. The ratio has been much lower than 1 over all these years, except in 2013–14 with ratio of 1.18. It signifies that fixed assets have been less than the net worth, implying they have been primarily financed by net worth, except in 2013–14 where long-term debt too has been used with net worth for financing fixed assets. It indicates a sound margin of safety for the creditors and also that there is net worth to finance the working capital requirements when needed. But, the ratio is showing an increasing trend which concerns the management not to increase this further and to improve the situation in this regard.

From the above discussion, it follows that RIL is not heavily dependent on long-term debt for financing its fixed assets. This is a safe position for RIL in regard to long-term stability.

2. Fixed Assets to Long-term Funds Ratio

Fixed assets should be financed primarily by the long-term funds, being representing a permanent investment. Long-term funds include both net worth plus long-term debt.

First, proprietors' funds should be used to finance the fixed assets and if they fall short of the requirement of the assets then this gap may be filled up by the long-term loans. The short-term loans should not be used to finance the fixed assets in any condition as it may result in serious financial embarrassment.

The fixed assets to long-term funds ratio provides the information about the sufficiency of long-term funds in financing the fixed assets and the extent of fixed assets financed by current debt due to lack of long-term funds. It is computed as:

$$\text{Fixed Assets to Long-tem Funds} = \frac{\text{Fixed Assets}}{\text{Long-term Funds Ratio}}$$

If the ratio is less than 1, it means that the long-term funds are more than the fixed assets. So, it signifies the proper financing of fixed assets by long-term funds. Also, the long-term funds are used to finance the working capital requirements too. Conversely, if the ratio is more than 1 then it means that the long-term funds are inadequate to finance the fixed assets and this gap is filled up by short-term loans. This is a very risky affair and is bound to result into acute shortage of working capital. Thus, this ratio is directly or indirectly linked to the concept of working capital too. Generally, the ratio of 0.65:1 is considered as an ideal one. Fixed assets to long-term funds ratio of the units under study has been recorded in Table 15.3.

Table: 15.3 Fixed Assets to Long-term Funds Ratio of RIL (2011-12 to 2013-14)

				(In Nos. of Times)
Year	**2011-12**	**2012-13**	**2013-14**	
Fixed Assets to Long-term Funds Ratio	0.76	0.78	0.89	
X				0.81
C.V				8.64

Source: Computed based on Annual Reports of RIL.

The table reveals that RIL quite satisfies the norm of fixed assets to long-term funds ratio with an average score of 0.81. The ratio has been on a continuous increasing trend during the period, from 0.76 in 2011–12 to 0.89 in 2013–14. The ratio has been less than 1, indicating that long-term funds have been adequate to finance the fixed assets throughout the period under study. The above analysis makes it clear that RIL has got sufficient long-term funds to finance its fixed assets requirements. But, there should not be any further increase over 1, otherwise it might be a concern

for working capital and will affect the day-to-day functioning of the concern. So, it must be checked by the concerned management of the unit.

3. *Utilization of Fixed Assets*

The fixed assets should be utilized efficiently, being of permanent nature so that they can yield the required rate of return in the interest of the business. They are the most important assets of any business undertaking and to measure the efficiency in their utilization, fixed assets turnover ratio is used.

The fixed assets turnover ratio shows how well the fixed assets are being utilized. It is computed as follows:

$$\text{Fixed Assets Turnover Ratio} = \frac{\text{Sales}}{\text{Fixed Assets}}$$

Here, fixed assets are net of depreciation. If compared with a previous period, it indicates whether the investment in fixed assets has been judicious or not. If the corresponding increase in sales is greater than the increase in investment in fixed assets, then the investment is justified and it also ensures the efficient use of the fixed assets. However, this ratio cannot be a good indicator of efficiency in the short run because a firm cannot adjust its fixed assets for short-term market fluctuations.

The higher the turnover ratio, the more efficient the management and utilization of the assets while low turnover ratio is indicative of underutilization of available resources and presence of idle capacity, that is, firm has an excessive investment in fixed assets in comparison to the volume of sale. However, if the ratio is very high then it indicates that the firm is over-trading on its assets. The standard for this ratio is 5 times in a manufacturing industry.[2] In a manufacturing concern, it is very important and appropriate since sales are produced not only by use of working capital but also by the capital invested in fixed assets. The fixed assets turnover ratio of the units under study is cataloged in Table 15.4.

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[2] C. A. Westwick, Management : How to Use Ratios, Essex: Gower Press Ltd. , 1973, p.5.

Table 15.4 Fixed Assets Turnover Ratio of RIL (2011-12 to 2013-14)

				(In Nos. of Times)
Year	**2011-12**	**2012-13**	**2013-14**	
Fixed Assets Turnover Ratio	2.03	2.06	1.68	
X				1.92
C.V				10.98

Source: Computed based on Annual Reports of RIL.

A close look into the table clearly spells out that RIL has been utilizing the fixed assets efficiently and this is evident from their increasing trend from 2011–2 to 2012–13. But, there is decline as well in 2013–14, indicating under-utilizing of the available resources. It does not satisfy the norm of a standard ratio of 5:1. So, the management can think to improve the performance in this area. First of all, it has to stop this decline in the ratio and after that; it has to think about the applicability of the standard ratio to the concern.

4. Adequacy of Depreciation

Depreciation refers to periodic allocation of the acquisition cost of tangible long-term assets, less salvage value (if any) over its estimated useful life in a systematic and rational manner. It is a process of allocation, not of valuation. From financial management's point of view, depreciation denotes the measure of the contribution of fixed assets to circulating capital. It represents a measure of the services of fixed assets consumed or utilized. The Institute of Chartered Accountants of India defines depreciation as follows:

"Depreciation is a measure of the wearing out, consumption or other loss of value of depreciable asset arising from use, effluxion of time or obsolescence through technology and market changes. Deprecation is allocated so as to charge a fair proportion of the depreciable amount in each accounting period during the expected useful life of an asset. Depreciation includes amortization of assets whose useful life is predetermined."[3]

[3] AS–6, Depreciation Accounting, New Delhi : The Institute of Chartered Accountants of India, Nov.1982, para 3.1.

The financial executives may adopt either the straight-line method or any of the accelerated methods for charging depreciation. The accelerated methods include (i) written down value method, (ii) sum of-the-years digit method, and (iii) double declining method. The adequacy of depreciation fund at the time of replacement of an existing asset is the chief concern of the finance manager. Legal provisions prescribed under the Companies Act, 1956 and Income-Tax Act, 1961, nature of business, financial reporting, effects on managerial decisions, inflation, technology and capital maintenance, and so on. are the various factors influencing the selection of deprecation method and the rate thereof.

The adequacy of depreciation can be conveniently measured on the historical cost basis. For this, the trends of depreciation and gross block are compared with each other. If both the trends move in the same direction, it can be inferred that adequate depreciation has been provided. If the trend of gross block is increasing while that of depreciation is decreasing, it indicates that depreciation provided is not adequate. Tables 15.5 and 15.6 depict the depreciation practice of RIL.

Table 15.5 Depreciation Policy of RIL (2011-12 to 2013-14)

				(Rs. in million)
Particulars	**2010-11**	**2011-12**	**2012-13**	**2013-14**
RIL				
Gross Block	1,540,630	1,572,240	1,608,210	1,658,110
Depreciation	609,790	692,230	778,590	853,870

Source: http://www.ril.com.

Note: Tangible Assets include own assets and leased assets.

Table 15.6 Depreciation Trend of RIL (2011-12 to 2013-14)

				(Rs. in million)
Particulars	**2010-11**	**2011-12**	**2012-13**	**2013-14**
RIL				
Gross Block	100	102.05	102.29	103.10
Depreciation	100	113.52	112.48	109.67

Source: Computed based on Annual Reports of RIL.

Table 15.6 contains the trend of depreciation and gross block of RIL. The trends have been calculated by taking the figures of 2010–11 as base period. The table reveals that that the trends related to gross block as well as depreciation of the unit are showing contradictory picture. Gross block is increasing, whereas deprecation is decreasing, showing inadequacy of

deprecation for the require replacement of assets in time. So, it can be inferred that adequate depreciation needs to be provided.

Tangible Assets and Depreciation Policy at RIL

Tangible Assets

Tangible Assets are stated at cost net of recoverable taxes, trade discounts and rebates and include amounts added on revaluation, less accumulated depreciation and impairment loss, if any. The cost of tangible assets comprises its purchase price, borrowing cost and any cost directly attributable to bringing the asset to its working condition for its intended use, net charges on foreign exchange contracts and adjustments arising from exchange rate variations attributable to the assets.

Subsequent expenditures related to an item of tangible asset are added to its book value only if they increase the future benefits from the existing asset beyond its previously assessed standard of performance. Projects under which assets are not ready for their intended use are shown as Capital Work-in-Progress.

Depreciation

Depreciation on fixed assets is provided to the extent of depreciable amount on the Written Down Value (WDV) method except in case of assets pertaining to Refining segment and SEZ units/developer where depreciation is provided on straight-line method (SLM). Depreciation is provided at the rates and in the manner prescribed in Schedule XIV to the

Companies Act, 1956 except in respect of the following assets, where rates higher than those prescribed in Schedule XIV are used;

Particular	**Depreciation**
Fixed bed catalyst (useful life:2 years or more)	Over its useful life as technically assessed
Fixed bed catalyst (useful life: up to 2 years)	100% depreciated in the year of addition
Assets acquired from 1stApril, 2001 under finance lease	Over the period of lease term
Premium on leasehold land	Over the period of lease term

In respect of additions or extensions forming an integral part of existing assets and insurance spares, including incremental cost arising on account of translation of foreign currency liabilities for acquisition of fixed assets, depreciation is provided as aforesaid over the residual life of the respective assets. In respect of amounts added on revaluation, depreciation is provided as aforesaid over the residual lives of the assets as certified by the valuers'[4]

There is no doubt that all the undertakings have made enough provision for charging depreciation on fixed assets. But, none of them has earned sufficient profits to cover the depreciation. FCI and HMT have been loss-making units, so their position is quite understandable .But in case of other units, this is a very sorry state of affairs as all of them have been profit-making concerns. If they are not able to cover this depreciation amount even through their profits then how can they think of providing for other charges smoothly? That is really going to affect their growth adversely.

Conclusion and Suggestions

To sum up, one can say that the picture of fixed assets management as a whole in RIL selected for study is not very promising regarding investment outlay and depreciation trend.

It seems to follow the capital budgeting techniques or guidelines suggested by various committees or financial experts while taking vital decisions, but still areas of like investment in fixed assets or use of these assets after their acquisition need to be improved upon. In case of providing depreciation, the required backup in terms of sufficient profits earned in a year should be provided. In order to improve this situation in the unit regarding fixed assets management, it is suggested that:

- The management of the concern must estimate the requirements of fixed assets correctly to avoid any under or over-investment later on. Also, it should keep in mind the investment principles like the general norm of at least 70 percent of fixed assets of the total assets of the concern.

[4]http://www.ril.com/rportal1/DownloadLibUploads/1400665256661_AR21052014.pdf Accessed on 7th July, 2014.

- The necessary funds for the purpose of acquiring plant and machinery should be obtained by way of issuing new shares in case the internal funds are not sufficient. Dependence on borrowed capital should be avoided in any case.
- The management should improve its efficiency in the utilization of fixed assets to facilitate the smooth running of operating activities.
- The management should not merely provide adequate depreciation but also the adequate coverage for depreciation. This is possible by optimum utilization of resources and avoidance of all types of wastages.
- Also, the depreciation should be provided on the assets in proportion to the net profits earned during the year.
- Last, but not the least is that they should follow the capital budgeting techniques with their true uses and the guidelines suggested by the expert committees while taking such a vital decision.

CHAPTER 16

Capital Budgeting of Indian PSUs

The Present Chapter

It discusses the capital budgeting practices in public sector undertakings in India on case basis, viz. Vizag Steel and ONGC.

Introduction

Businesses look for opportunities that increase their share holders' value. In capital budgeting, the managers try to figure out investment opportunities that are worth more to the business than they cost to acquire. Ideally, firms should pursue all such projects that have good potential to increase the business worth. Since the available amount of capital at any given time is limited; therefore, it restricts the management to pick out only certain projects by using capital budgeting techniques which has potential to yield the most return over an applicable period of time.

Case Analysis

A. VIZAG Steel

Rashtriya Ispat Nigam Limited—Vishakhapatnam Steel Plant (RINL-VSP) popularly known as "Vizag Steel" the "Pride of Steel," is a leading Central PSU under the Ministry of Steel. It is the first shore based Integrated Steel Plant in the country.

It was set up in 1982. Its key areas of activities are Iron and Steel making with finished products like Billets, Wire Rods, Rounds, Square, and Flats.

Project Expansion of VSP:

VSP is operating at 6.3 M.T. of liquid steel at present. It is framed to enhance its capacity to produce 6.3M.T of liquid steel by expansion.

Approved cost: Rs. 8692 cr. (Base June, 05)
Debt component: Rs. 4346 cr.
Assumed in calculation as per rate as 5.5%.

1. Pay Back Period

Table 16.1 Payback Period of Vizag

S. No.	Years	Income (Profit After Tax)	Depreciation	Cash Inflows	Cumulative Cash Inflows
1	2005–06	1493	474	1967	1967
2	2006–07	1316	474	1790	3757
3	2007–08	1457	527	1984	5741
4	2008–09	2645	874	3519	9260
5	2009–10	3022	919	3941	13201
6	2010–11	3100	924	4024	17225
7	2011–12	3331	685	4016	21241
8	2012–13	3519	507	4026	25267
9	2013–14	3553	513	4066	29333
10	2014–15	3619	518	4137	33470
11	2015–16	3686	524	4210	37680
12	2016–17	3755	529	4284	41964
13	2017–18	3839	535	4374	46338
14	2018–19	3931	540	4471	50809
15	2019–20	4030	546	4576	55385

(a) Cash outlay: 8692

(b) Payback period: Initial investment/Annual cash inflow

= 3 + 2951/3519

= 3.10 years

It is assumed that the profit earning of the project will start from 2008–09. This expansion base year's incremental adjusted cash flow is taken for calculation.

Notes:

- Estimated profits are taken from the data provided.
- For cash inflows we have deducted depreciation from profit and then cumulative profit.

So, the projected payback period is calculated as 3.10 years.

2. Net Present Value (NPV)

Table 16.2 NPV of Vizag

S. No.	Years	Cash Inflows	DCF Values (19%)	Discounted Cash Flows (Rs.)
1	2005–06	1967	0.84	1652.28
2	2006–07	1790	0.706	1263.74
3	2007–08	1984	0.593	1176.51
4	2008–09	3519	0.499	1755.98
5	2009–10	3941	0.419	1651.28
6	2010–11	4024	0.352	1416.45
7	2011–12	4016	0.296	1188.74
8	2012–13	4026	0.249	1002.47
9	2013–14	4066	0.209	849.79
10	2014–15	4137	0.176	728.11
11	2015–16	4210	0.148	623.08
12	2016–17	4284	0.124	531.22
13	2017–18	4374	0.104	454.9
14	2018–19	4471	0.088	393.45
15	2019–20	4576	0.074	338.62
Total	Present Values of Inflows			15026.62

Discounting Rate comes out to be 19% as estimated by the company which includes risk assessment and economic and other factors.

Discounting Factors are taken from Present Value Tables for (rate = 19%) and which in turn is multiplied to the Cash inflow at end of that year to get the present values of Cash inflow at start of the project, that is, @ 2005–06.

NPV = Total Present Value of Cash Inflows – Total Outlay
= 15026.62 – 8692
= Rs. 6334.62 Cr.

3. Internal Rate of Return (IRR):

Table 16.3 IRR of Vizag

PV_1

S. No.	Years	Cash Inflows	DCF (18%)	Present Value of Inflows
1	2005–06	1967	0.847	1666.049
2	2006–07	1790	0.718	1285.22
3	2007–08	1984	0.609	1208.256
4	2008–09	3519	0.516	1815.804
5	2009–10	3941	0.437	1722.217
6	2010–11	4024	0.37	1488.88
7	2011–12	4016	0.314	1261.024
8	2012–13	4026	0.266	1070.916
9	2013–14	4066	0.225	914.85
10	2014–15	4137	0.191	790.167
11	2015–16	4210	0.162	682.02
12	2016–17	4284	0.137	586.908
13	2017–18	4374	0.116	507.384
14	2018–19	4471	0.099	442.629
15	2019–20	4576	0.084	384.384
Total	Present Values of Inflows(PV1)			15826.708

Discount rate is taken as 18%.

PV_2

S. No.	Years	Cash Inflows	DCF (35%)	Present Value of Inflows
1	2005–06	1967	0.741	1457.5
2	2006–07	1790	0.549	982.71
3	2007–08	1984	0.406	805.5
4	2008–09	3519	0.301	1059.2
5	2009–10	3941	0.223	878.84
6	2010–11	4024	0.165	663.96
7	2011–12	4016	0.122	489.95
8	2012–13	4026	0.091	366.37
9	2013–14	4066	0.067	272.42
10	2014–15	4137	0.05	206.85
11	2015–16	4210	0.037	155.77
12	2016–17	4284	0.027	115.67
13	2017–18	4374	0.02	87.48
14	2018–19	4471	0.015	67.065
15	2019–20	4576	0.011	50.336
Total	Present Values of Inflows			7659.62

Discount rate is taken as 35%.

$$\begin{aligned}
\text{IRR} &= r_1 + [(PV_1 - I/PV_1 - PV_2) \times (r_2 - r_1) \\
&= 18 + (15826.708 - 8692 / 15826.708 - 7659.6921) \times (35 - 18) \\
&= 18 + 7134.708 / 8167.016 \times 17 \\
&= 18 + 0.874 \times 17 \\
&= 32.85\%
\end{aligned}$$

B. Oil and Natural Gas Corporation Limited (ONGC)

Oil and Natural Gas Corporation Ltd (ONGC) is a central public sector undertaking, mainly engaged in the oil exploration and production activities. The company operates in two segments: Offshore and Onshore. Its subsidiaries include ONGC Videsh Limited (OVL), Mangalore Refinery & Petrochemicals Ltd., ONGC Nile Ganga BV, ONGC Narmada Ltd, ONGC Amazon Alaknanda Ltd, ONGC Campos Ltd, ONGC Nile Ganga (Cyprus) Ltd, and ONGC Nile Ganga (San Cristobal) BV.

CDM Project–ONGC Mehsana Asset

The Clean Development Mechanism (CDM) was designed to meet a dual objective:

- To help developed countries fulfill their commitments to reduce emissions, and
- To assist developing countries in achieving sustainable development.

CDM projects earn tradable, saleable certified emission reduction (CER) credits that can be used by industrialized countries to meet a part of their emission reduction targets under the Kyoto Protocol.

Project Details

Initial Investment	Rs. 7.67 cr.
Operating Cost	Rs. 1.26 cr.
Depreciation @ 10%	Rs. 0.77 cr.
Investment Period	10 years
Net Annual Savings	Rs. 2.50 cr.
Annual Tax Rate	35%

Cash Flow Details

Table 16.4 Cash Flows of ONGC

Years	0	1	2	3	4	5	6	7	8	9	10
Investments	−7.67										
Opr. Cost + Depr.		2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03	2.03
Revenue		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
PBT		0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Tax		0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Net PAT		0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
Total CFI	−7.67	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08

Table 16.5 NPV of ONGC

NPV (at different Interest Rates)

Interest Rates	NPV (in Year of Investment)	Years										
		0	1	2	3	4	5	6	7	8	9	10
0	3.13	−7.67	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
1	2.56	−7.67	1.07	1.06	1.05	1.04	1.03	1.02	1.01	1.00	0.99	0.98
2	2.03	−7.67	1.06	1.04	1.02	1.00	0.98	0.96	0.94	0.92	0.90	0.89
3	1.54	−7.67	1.05	1.02	0.99	0.96	0.93	0.90	0.88	0.85	0.83	0.80
4	1.09	−7.67	1.04	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73
5	0.67	−7.67	1.03	0.98	0.93	0.89	0.85	0.81	0.77	0.73	0.70	0.66
6	0.28	−7.67	1.02	0.96	0.91	0.86	0.81	0.76	0.72	0.68	0.64	0.60
7	−0.08	−7.67	1.01	0.94	0.88	0.82	0.77	0.72	0.67	0.63	0.59	0.55

(Continued)

Table 16.5 Continued

NPV (at different Interest Rates)

Interest Rates	NPV (in Year of Investment)	Years										
		0	1	2	3	4	5	6	7	8	9	10
8	−0.42	−7.67	1.00	0.93	0.86	0.79	0.74	0.68	0.63	0.58	0.54	0.50
9	−0.74	−7.67	0.99	0.91	0.83	0.77	0.70	0.64	0.59	0.54	0.50	0.46
10	−1.03	−7.67	0.98	0.89	0.81	0.74	0.67	0.61	0.55	0.50	0.46	0.42

Notes:

- Since interest rates are not known, it is taken as a variable and different NPVs are calculated respectively.
- Interest Rates are on Vertical Axis
- Number of years is on horizontal Axis
- The data has been obtained by multiplying the Cash inflows for years with Discounting factors for that particular year and Interest Rate.

NPV = Present Value of Future Cash Inflows – Cash Outflows (Investment Cost)

Interest Rates	0	1	2	3	4	5	6	7	8	9	10
NPV (in Year of Investment)	3.13	2.559	2.031	1.543	1.09	0.669	0.279	−0.085	−0.423	−0.739	−1.034

Table 16.6 IRR & Payback Period of ONGC

Years	0	1	2	3	4	5	6	7	8	9	10
Total CFI	−7.67	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
		1.08	2.16	3.24	4.32	5.4	6.48	7.56	8.64	9.72	10.8

For payback period, we will find the cumulative sum of all the inflows till it matches the investments.

So, payback period comes out to be 7.10 years

By interpolating, IRR comes out to be = 6.76%

Conclusion

1. VIZAG Steel

- The project completion cost is estimated to be Rs. 8692. cr.
- The payback period of the project in VSP is 3 years and 10 months. The payback period is less than the target period so the project may be accepted.
- The NPV of the project is positive than the value of the capital.
- The IRR of 31.85% is greater than the cost of capital that is, 19%, so the project is accepted.

2. ONGC (CDM Project)

- The payback period for the project is 7.10 years.
- The IRR is 6.67%.
- Since it is a government initiative even a negative IRR and a longer payback period will also be justified, as this is for a social cause.

CHAPTER 17

Capital Investment Practices of Oil Sector in India

The Present Chapter

It discusses the capital budgeting practices in Indian oil sector, of ONGC and Cairns India, on comparative basis. ONGC as discussed in the last chapter is a public sector undertaking, whereas Cairns India is s private sector enterprise. Their comparative analysis of capital budgeting practices will give a better insight into the process for managerial implications.

Introduction

1. ONGC

(a) History

As discussed in the preceding chapter, Oil and Natural Gas Corporation Limited (ONGC) is an Indian multinational oil and gas company headquartered in Dehradun, India. It is a public sector undertaking (PSU) of the Government of India, under the administrative control of the Ministry of Petroleum and Natural Gas. It is India's largest oil and gas exploration and production company. It produces around 69% of India's crude oil (equivalent to around 30% of the country's total demand) and around 62% of its natural gas. ONGC was founded on August 14, 1956 by Government of India, which currently holds a 69.23% equity stake.

ONGC has been ranked 357th in the Fortune Global 500 list of the world's biggest corporations for the year 2012. It is ranked 22nd among the Top 250 Global Energy Companies.

(b) Shareholding

Shareholders (as on 31-Mar-2013)	Shareholding
Promoter—Government of India	69.23%
Government Companies	10.09%
Banks, Financial Inst. and Insurance companies	9.68%
Foreign Institutional Investors (Fll)	6.27%
Private Corporate Bodies	1.83%
Individual shareholders	1.65%
Mutual Funds and UTI	1.13%
NRI/Employees	00.11%
Total	100.0%

2. CAIRN India

The company is primarily engaged in the business of surveying, prospecting, drilling, exploring, acquiring, developing, producing, maintaining, refining, storing, trading, supplying, transporting, marketing, distributing, importing, exporting and generally dealing in minerals, oils, petroleum, gas and related by-products and other activities incidental to the above.

Cairn India is part of the Vedanta Group, a globally diversified natural resources group with wide ranging interests in aluminum, copper, zinc, lead, silver, iron ore, and so on.

In 2006 Cairn spun off its production interests in Western and Eastern India into a separate company called Cairn India Limited. Cairn Energy maintains a 69.9% initial interest in Cairn India. Cairn India is one of the largest independent oil and gas exploration and production companies in India It operates ~30 percent of India's domestic crude oil production.

Investment Pattern of Long-Term Assets

Following is the discussion about long-term assets' investment pattern of both the units under study.

Table 17.1 Net Fixed Assets' Position

	Mar-09	Mar-10	Mar-11	Mar-12	Mar-13
ONGC (Net fixed assets)	885,517	1,011,565	1,188,156	1,412,430	1,647,049
Cairn (Net Fixed assets)	65,674	97,899	373,097	387,694	289,750

Source: Companies' Annual Reports.

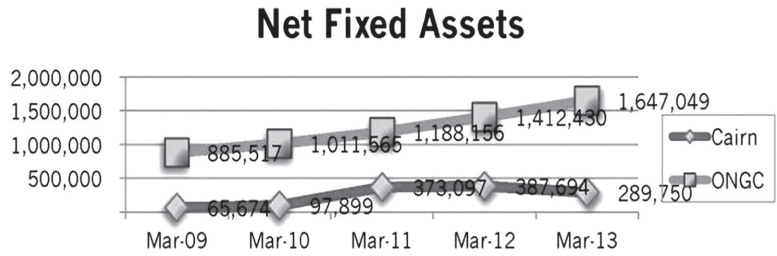

Figure 1: Net fixed assets' trend

It is evident from the above that both the companies have shown an increasing trend of fixed assets, except Cairn dipping in 2013. But still, Cairn has shown around 5 times increase in fixed assets as compared to ONGC's two times growth. This clearly indicates that Cairn is on a much faster expansion mode than ONGC.

Major Strategy for Long-Term Growth

1. ONGC

- Strengthening its core activities that is, Exploration and Production (E&P) of oil and gas.
- Prioritized opening up new growth avenues through exploration of new sources of energy
- Integration in the entire hydrocarbon value chain.
- Conversion of PELs into MLs.
  - Focus on expeditious conversion of Petroleum Exploration Licenses (PEL) to Mining Lease (ML).

- Expeditious development of discoveries.
  - 12 major projects for development of 36 new fields and one project for additional development of D-1 field.
- Prudent reservoir management to increase field life.
  - The Improved Oil Recovery (IOR) and Enhanced Oil Recovery (EOR) schemes implemented in 15 major fields.
- Intensifying exploration for new sources of energy.
  - Coal Bed Methane (CBM)/Underground Coal Gasification (UCG)/Shale Gas Exploration/ Alternate sources of energy/Wind energy/Hydro power.
- Commissioning of ongoing integration projects.
- Studying the feasibility for setting up nuclear power plants with Nuclear Power Corporation of India Limited (NPCIL).
- Evaluating the feasibility to venture into City Gas Distribution (CGD) projects in collaboration with reputed companies.
- Perspective Plan 2030.
- Grow overseas E&P to source 60 mmtoe/year by 2030.
  - Secure alliances to develop new resource types.
  - Unlock more than 400 mmtoe from domestic YTF (yet-to-find) reserves.
  - Accelerate (re)development of discovered domestic reserves.
  - Grow non-E&P business to 30 percent of revenue by 2030.

2. CAIRN India

- Focus on exploration-led growth.
- Progress development assets to transform discovered resources to reserves and cash flow generation.
- Hold a focused, balanced asset portfolio.
- Appropriate exposure to growth potential in frontier basins.
- Exploration strategy to focus on frontier or overlooked basins geological potential.
- Divestment of nonmaterial equity for portfolio optimization.
- Investment of $ 3 billion for future growth—55% for Production; 45% in Exploration.

- Ample cash reserves to meet strategic initiatives and future expansion programs.
- Growing international exposure.
- Portfolio diversity across India.

Key Terms

Financial management: It is the process of procurement and allocation of funds and distribution of profits among shareholders.

Capital budgeting: The investment in fixed assets is called as capital budgeting decision.

Working capital management: The investment in current assets is called as working capital decision.

Financial structure: It is total amount of funds of a business organization.

Fixed assets: These are the resources which are acquired for long-term use and are not meant for resale in current year.

Tangible fixed assets: These fixed assets are those which can be seen and felt, like land and building, plant and machinery, equipment, furniture, and so on.

Intangible fixed assets: These are the assets which cannot be seen or felt, having no physical existence in them. Examples of such assets include goodwill, patents, copyrights, and so on.

Expansion decision: It is a decision of increasing the firm's production capacity and operations by adding new products and additional machines.

Diversification decision: It is deciding to entering into new lines of business either product wise or territory wise.

Independent projects: These projects are not affected by the acceptance of any other project.

Dependent projects or Contingent projects: They depend on the acceptance of other proposals.

Mutually exclusive projects: These are the projects wherein; the decision to invest in one project affects other projects because only one project can be selected.

Payback period: It is the time period of recovery of initial investment.

Discounted payback period: It is the time period required by the cumulative discounted cash flows to recover the initial investment.

Accounting rate of return (ARR): It is the average return from a project based on accounting profit.

Net present value (NPV): It is the difference between the present value of net cash inflows and cash outflows.

Profitability index (PI): It is a ratio of the present value of inflows to the present value of outflows.

Internal rate of return (IRR): It is the discounting rate that equates the present value of cash outflows and cash inflows.

Modified internal rate of return (MIRR): Unlike IRR, it assumes that positive cash flows are reinvested at the firm's cost of capital, and the initial outlays are financed at the firm's financing cost.

Margin of safety: It is the cushion of total sales over break-even sales.

Sensitivity analysis: It analyzes the effect of a key variable on the project profitability under given conditions.

Scenario analysis: It finds out the impact of a given scenario on a project based on various considerations.

Decision tree analysis: It is a graphical representation of potential scenarios based on the project's cash flow.

Monte Carlo simulation: It is the computerized version of scenario analysis which uses continuous probability distributions.

Feasibility study: It is an analysis of the viability of an idea/project.

Pre-feasibility study: It is conducted before the final feasibility study to sort out the relevant scenarios.

Business plan: It is prepared to provide a "roadmap" of how the business will be created and developed.

SWOT analysis: It is the analysis of an organization's strengths and weaknesses and the opportunities and threats faced by it.

Problem tree analysis: It is a method of identifying the problems, laying down their interconnectedness and predicting how a project will address those problems.

Stakeholder analysis: It is determining the people who have an interest in the project and who get affected by the project and/or can influence the success or failure of that project.

Logical framework analysis (LFA): It is a methodology for establishing a framework for the evaluation of projects.

PERT analysis: Program evaluation and review technique (PERT) is a planning and control tool used for defining and controlling the tasks necessary to complete a project.

CPA: Critical path analysis (CPA) is an organized technique to planning, scheduling and controlling practical situations where many separate jobs, in a given task, can happen simultaneously or in sequence.

Social costs benefit analysis (SCBA): It is a part of project appraisal which involves social assessment of the project.

Time value of money: It describes the relationship between the value of Rupee toady and value of Rupee in future.

Compounding: It refers to the future value of a present sum of money.

Discounting: It denotes the present value of a future sum of money.

Sunk costs: These are the cash outflow associated with the project which have already occurred and will not be affected by the decision to purchase the asset.

Opportunity cost: It is the return that can be earned by investing funds in assets similar to those which are owned by the firm.

Terminal cash flows: These are the cash flows that occur only at the end of the life of the asset.

Nominal cash flow: It means the income received in terms rupees.

Real cash flow: It means purchasing power of your income.

Adjusted present value (APV): It uses ungeared cost of equity to calculate discount rate unlike NPV.

Nonconventional cash flows: These are the cash flows which change sign more than once during the life of the project.

Risk: It is the variability that is likely to occur in future returns from the investment.

Market or systematic risk: It is the stock market's assessment of a firm's risk, measured by its beta.

Probability measure: It is defined as the likelihood of occurrence of an event.

Standard deviation: It is the square root of variance and an absolute measure of dispersion.

Coefficient of variation: It is a relative measure of dispersion and used where the projects involve different outlays/different expected value.

Certainty equivalent coefficient: It is the certainty factor of cash flows in a project.

Risk-adjusted discount rate: It is the sum total of risk-free rate and risk-premium rate.

Key factor: It is the limiting factor which influences the project decision-making to a critical level.

Capital rationing: It is the process of allocating money among different projects, where the amount of money to be invested is limited.

Cost of capital: It is the cost of raising the funds for investment purposes. It is often referred to as *cut-off rate, target rate of return, hurdle rate or WACC.*

Explicit costs: These are the costs that the firm pays to procure a source of finance, like cost of debt.

Implicit costs: They are an opportunity cost and comprise of cost of equity and retained earnings.

Beta (β): It is a measure of the volatility or sensitivity of a security's return in relation to changes in the returns of the overall capital or stock market.

Post completion audit (PCA): It is a formal process that checks the outcomes of individual investment projects after the initial investment is completed and the project is operational.

Review Questions

Chapter 1
Nature of Financial Management

1. What do you mean by financial management? Explain its elements.
2. "Profit motive is not the main objective of financial management." Discuss.
3. What are the objectives of financial management of a business organization?
4. Discuss the various functions of financial management.
5. "The financial management scenario for Indian businesses has undergone sea changes over the last decade." Explain.
6. "Financial management like other management areas has its own share of problems." Discuss them, suggesting solution for them.

Chapter 2
Capital Budgeting: Nature & Scope

1. How do you define capital budgeting? Explain its characteristics.
2. "Capital budgeting decision is the most important decision of the financial management of any organization." Argue.
3. What are fixed assets?
4. Discuss the process of capital budgeting in detail.
5. What are the different types of capital budgeting projects? Explain with regard to nature and exclusiveness.
6. Discuss various capital budgeting appraisal methods in brief.
7. How do you evaluate risk of capital investment projects?

Chapter 3
Project Feasibility

1. What is the meaning of Project feasibility?
2. Discuss the various steps in the process of feasibility study.
3. What are the different types of feasibility studies?
4. "Feasibility study is not similar to a business plan." Explain.
5. What are the prerequisites of a good feasibility study?
6. How project feasibility study is important to capital budgeting decision? Elaborate.
7. Discuss the key issues in project appraisal?

Chapter 4
Project Management Techniques

1. Discuss the various techniques of project management.
2. Distinguish between PERT and CAPM.
3. "SWOT analysis is required in every project and every organization—big or small."
4. "Every organization strives to satisfy stakeholders." Discuss the relevance of stakeholders analysis for project decision in this context.

Chapter 5
Social-costs Benefit Analysis

1. Define SCBA.
2. Discuss the approaches which are used in social-cost benefit analysis.
3. Which one is better approach among UNIDO and Little Mirrlees for measuring social-costs benefit?

Chapter 6
Time Value of Money

1. What is the time value of money? How is it important in capital budgeting decision?

2. What are the valuation methods of time value of money?
3. "Discounting is more useful in appraising a project than compounding." Explain.

Chapter 7
Determination of Cash Flows

1. Explain the concept of cash flows in CAPEX decision.
2. What are the factors which are considered in estimating cash flows while arriving at capital investment decision?
3. What is the significance of relevant cash flows in capital budgeting?
4. Discuss the types of incremental cash flows.
5. "Cash flows in capital budgeting are most affected by inflation." Explain.
6. Differentiate between nominal cash flows and real cash flows.

Chapter 8
Capital Budgeting Appraisal Methods

1. Discuss the basic capital budgeting appraisal techniques.
2. What are the discounted cash flow techniques which are used for evaluating capital investment?
3. "Payback method is a break-even method of capital budgeting appraisal." Explain.
4. "APV method overcomes the limitation of Net present value method." Discuss.
5. "MIRR is a refined version of IRR." Prove.
6. Which one is better method of capital budgeting appraisal between NPV and IRR?
7. "Accounting rate of return is the traditional method of capital budgeting appraisal." Explain.
8. How one can achieve effective capital budgeting? Discuss the factors for effective CAPEX management.
9. "Capital budgeting practices are not uniform in every sector." Examine this in the light of business and government sector.

Chapter 9
Risk Analysis in Capital Budgeting

1. Define risk. What are the different types of project risk?
2. Discuss the statistical techniques for risk analysis of a project.
3. "The ultimate risk evaluation techniques for capital budgeting are financial techniques." Explain.
4. "Sensitivity analysis is also called as what-if analysis." Why?
5. "Scenario analysis removes the limitation of sensitivity analysis." Explain.
6. "Simulation is a computer generated technique of project risk management?
7. "Decision tree is a graphical representation of the decision choices of a project." Discuss.

Chapter 10
Capital Budgeting under Capital Rationing

1. What do you mean by capital rationing? Explain.
2. What are the factors which are relevant for capital rationing of a project?
3. Discuss the problems which arise in capital rationing.
4. How capital rationing affects capital investment decisions?
5. Distinguish between external capital rationing and internal capital rationing.

Chapter 11
Cost of Capital

1. What is the meaning of WACC?
2. How the cost is classified for financing project decisions?
3. "Interest on debt is tax-deductible expense." Explain.
4. What is CAPM? Discuss its usefulness in computing cost of equity.
5. "Beta determines the market reaction to the company's performance and thereby decides the cost of equity." Discuss.

6. Which weights are practical in nature among book value and historical weights for computing cost of capital?

Chapter 12
Capital Budgeting for the Multinational Firms

1. Discuss the factors which affect international capital budgeting.
2. What process is followed for evaluating foreign capital projects?
3. What are the key issues in foreign capital investment?
4. "International capital budgeting is far more complex than domestic capital budgeting." Explain.

Chapter 13
Postcompletion Auditing of Capital Budgeting Decision

1. What is the meaning of postcompletion auditing? How is it useful in capital budgeting decision?
2. Discuss the process of postcompletion review which is followed in a capital budgeting decision.
3. What are the key factors in postcompletion auditing?

Chapter 14
Capital Investment Issues and Challenges

1. "No capital investment is free from inherent issues." Explain.
2. "There are multiple challenges which are emerging every day for capital budgeting decisions." Discuss.

Test Yourself—Problems & Solutions

1. The A&B Company has sales of Rs. 200 million and total operating expenses (excluding depreciation) of Rs.120 million. Straight-line depreciation on the company's assets is Rs.15 million, and the maximum accelerated depreciation allowed by law is Rs. 25 million. Assume that all taxable income is taxed at 35 percent and the net operating working capital remains constant. Calculate the company's after tax operating cash flow using both straight-line and accelerated depreciation.

Solution:

After tax operating cash flow (assuming straight-line depreciation):

Revenues	Rs.200 mn
Total operating expenses	120 mn
Depreciation	15 mn
Operating earnings before taxes	Rs. 65 mn
Tax @ 35%	22.75 mn
Operating earnings after taxes	42.25 mn
Depreciation	15 mn
After tax operating cash flow	Rs. 57.25 mn

After tax operating cash flow (assuming accelerated depreciation):

Revenues	Rs.200 mn
Total operating expenses	120 mn
Depreciation	25 mn
Operating earnings before taxes	Rs. 55 mn
Tax @ 35%	19.25 mn
Operating earnings after taxes	35.75 mn
Depreciation	25 mn
After tax operating cash flow	Rs. 60.75 mn

2. Assume that A's interest rate on newly-issued debt is 8% and the corporate tax rate is 35%. This implies a 5.2% after-tax component cost of debt. The firm has decided to finance next year's project by selling debt. Does this mean that next year's investment project has a 5.2% cost of capital?

Solution:

The answer is No. In financing a project with debt, the firm usually explores various possible options and always tries to obtain low-cost debt financing. As expansion takes place, the firm may raise additional high-cost equity to avoid unacceptably high leverage. As a result, the current component cost of debt hardly measures the true long-term opportunity cost of debt financing.

For example, suppose the firm has a current 5.2% cost of debt and a 10% cost of equity. In the first year it borrows heavily, using the debt in the process, to finance projects yielding 7%. In the second year, it has projects available that yield 9%, or substantially above the return on first-year projects, but it cannot accept them because they would have to be financed with 10% equity. Therefore, to avoid this problem, the firm is viewed as an ongoing concern, and the cost of capital is calculated as a weighted average of the various types of funds it uses.

3. Healthcare is a leading pharmaceutical company in India. Its income statement for the year 2012–13 is as follows:

Sales revenue	Rs.1,800,000
Total costs	
Cost of goods sold	1,220,000
Wages and salaries	240,000
Rent	100,000
Depreciation	80,000
Office & marketing expenses	50,000
Miscellaneous	10,000
Total	1,700,000
Net profit before tax	100,000

The company is considering starting a new distribution office in northern India. It would require an incremental investment of Rs. 20,000 to lease office, furniture, and other things for 3 years. The new marketing office is expected to bring increase in annual sales by Rs. 50,000 with an additional burden of Rs. 20,000 consumable expenses per year. The office is also expected to increase wage and salary expenses by 8%.

(a) Calculate net incremental cash flows for the new office.
(b) Assume that the company has the capital necessary to purchase the office and the opportunity cost of the funds is 12%, should the office be purchased?

Solution:

(a) The relevant annual cash flows from the proposed marketing office are:

Incremental revenue	Rs.50,000
Increment cost	
Consumables	Rs. 20,000
Wages and salaries (Rs. 240,000 × 0.08)	19,200
Total incremental cost	39,200
Net incremental annual cash flow	Rs. 10,800
Incremental investment	Rs. 20,000

(b) This would be decided based upon NPV.

The *NPV* for the proposed office should be calculated to determine the economic viability of the project.

$$\begin{aligned} NPV &= (\text{Incremental annual cash flow})\ (\text{PVIFA}, N = 3, i = 12\%) \\ &\quad - \text{Rs. } 20{,}000 \\ &= \text{Rs. } 10{,}800(2.401) - \text{Rs. } 20{,}000 \\ &= \text{Rs. } 25{,}930.8 - \text{Rs. } 20{,}000 \\ &= \text{Rs. } 5{,}930.8 \end{aligned}$$

Since, the *NPV* is positive, it can be purchased.

4. Calculate the NPV for the following project with the following cash flows: an initial outlay of Rs. 20,500 followed by inflows of Rs. 6,500 for 3 years and then a single inflow in the fourth year of Rs. 18,000 at a cost of capital of 9%.

Solution:

$$\begin{aligned}NPV &= -Rs.20,500 + Rs.6,500[PVIF9\%,3] + Rs.18,000[PVIF9\%,4]\\ &= -Rs.20,500 + Rs.6,500(2.531) + Rs.18,000(.708)\\ &= -Rs.20,500 + Rs.16,451.5 + Rs.12,744\\ &= -Rs.8,695.5\end{aligned}$$

5. Calculate the NPV for a project with an initial outflow of Rs. 5,000 followed by inflows of Rs. 3,000, Rs. 2,000, and Rs. 1,000 at 1 year intervals.

Solution:

$$\begin{aligned}NPV &= C0 + C[PVIFA_{i,n}]\\ &= -Rs.\ 5,000 + Rs.\ 3,000[PVIF12\%,1] + Rs.\ 2,000[PVIF12\%,2]\\ &\quad + Rs.\ 1,000[PVIF12\%,3]\\ &= -Rs.\ 5,000 + Rs.\ 3,000(.893) + Rs.\ 2,000(.797) + Rs.\ 1,000(.712)\\ &= -Rs.\ 5,000 + Rs.\ 2,679 + Rs.\ 1,594 + Rs.\ 712\\ &= -Rs.\ 5,000 + Rs.\ 4,985\\ &= Rs.\ 15\end{aligned}$$

6. L&M Mining Inc. plans to buy a mine in southern India. Buying, setting-up operations and initial digging will cost Rs. 5 million. The first year's operations are expected to bring a positive cash flow of only Rs. 500,000. Then, there will be 4 years of Rs. 2 million cash flows after which the ore will run out. Closing the mine and restoring the environment in the sixth year will cost Rs.1 million. Calculate the project's NPV at a cost of capital of 12% and the IRR.

Solution:

(Rs.000)

$$\begin{aligned}NPV &= -Rs.5,000 + Rs.500[PVIF12\%,1] + [PVIF12\%,1]\\ &\quad \{Rs.2,000[PVIFA12\%,4]\} - Rs.\ 1,000[PVIFA12\%,6]\\ &= -Rs.\ 5,000 + Rs.\ 500(.893) + (.893)\{Rs.\ 2,000(3.037)\}\\ &\quad - Rs.1,000(.507)\\ &= -Rs.5,000 + Rs.\ 446.5 + Rs.\ 5,424.08 - Rs.\ 507\\ &= Rs.363.58\end{aligned}$$

IRR is approximately 15%

7. Softy & Brothers plan to bid on a contract that is expected to yield the following after-tax net cash flows at the end of each year:

Year	Net Cash Flow
1	Rs. 5,000
2	8,000
3	9,000
4	8,000
5	8,000
6	5,000
7	2,000
8	−1,000

To get the contract, the firm must spend Rs. 50,000 on overhauling the plant. The opportunity rate of return is 12% compounded annually. The depreciation tax benefit is there in the net cash flows. Compute the project's NPV. Should the project be accepted?

Solution:

Year	Cash Flows	PVIF @ 12%	Present Value
0	−Rs. 50,000	1.000	−Rs. 50,000
1	5,000	0.893	4,465
2	8,000	0.797	6,376
3	9,000	0.712	6,408
4	8,000	0.636	5,088
5	8,000	0.567	4,536
6	5,000	0.507	2,535
7	2,000	0.452	904
8	−1,000	0.404	−404

Net Present Value − Rs. 20,092.

Since, the project has a negative NPV it should not be accepted.

8. You have a business opportunity to invest Rs. 20,000 in a ready-made garments manufacturing business. The offer is that you would receive Rs. 7,000 at the end of each year in interest with the full Rs. 20,000 to be repaid at the end of a five-year period.

A. Assuming a 10% required rate of return, calculate the present value of cash flows and the net present value of the proposed investment.
B. Based on this same interest rate assumption, calculate the cumulative cash flow of the proposed investment for each period in both nominal and present-value terms and calculate the payback period in both nominal and present-value terms?

Solution:

A. The present value of cash flows and the net present value of the proposed investment are calculated as follows:

Year	Cash Flow	Present Value Interest Factor	Present Value Cash Flow
0	(Rs. 20,000)	1.000	(Rs. 20,000)
1	7,000	0.909	6,363
2	7,000	0.826	5,782
3	7,000	0.751	5,257
4	7,000	0.683	4,781
5	7,000	0.620	4,240

Cost of Capital 10%

Present Value of Benefits	Rs. 26,523
Present Value of Cash outflows	Rs. 20,000
Net Present Value	Rs. 6,523

B. The cumulative cash flow of the proposed investment for each period in both nominal and present-value terms is:

Year	Cash Flow	Present Value Interest Factor	Present Value Cash Flow	Cumulative Cash Flow	Cumulative PV Cash Flow
0	(Rs. 20,000)	1.000	(Rs. 20,000)	(Rs. 20,000)	(Rs. 20,000)
1	7,000	0.909	6,363	(13,000)	(13,637)
2	7,000	0.826	5,782	(6,000)	(7,855)
3	7,000	0.751	5,257	1,000	(2,598)
4	7,000	0.683	4,781	8,000	2,183
5	7,000	0.620	4,240	15,000	6,423

Simple Payback Period 2.14 years (= 2 + Rs. 1,000/Rs. 7,000)
Present Value Payback Period 3.54years (= 3 + Rs.2,598/Rs.4,781).

Note: Payback in nominal terms is Simple payback period and in present value term is Discounted payback.

9. Asian Enterprises Ltd. has two proposed capital investment projects, projects A and B. Both the projects are hi-tech power systems for office maintenance. Each project has a cost of Rs. 10,000 and the cost of capital for both projects is 12%. The projects' expected net cash flows are as follows:

Expected Net Cash Flow		
Year	**Project A**	**Project B**
0	(Rs.10,000)	(Rs.10,000)
1	6,000	3,000
2	4,000	4,500
3	3,000	3,500
4	1,000	3,000

From the above,

(i) Calculate each project's payback period, net present value (NPV), profitability index, and internal rate of return (IRR).
(ii) Should both projects be accepted if they are interdependent?
(iii) Which project should be accepted if they are mutually exclusive?

Solution:

(i) Payback

To calculate the payback period, we need to determine the cumulative cash flows for each project:

Cumulative Cash Flows		
Year	**Project A**	**Project B**
0	(Rs.10,000)	(Rs.10,000)
1	(4,000)	(7,000)
2	0	(2,500)

Cumulative Cash Flows		
Year	**Project A**	**Project B**
3	3,000	1,000
4	4,000	4,000

$$\text{Payback (A)} = 2 \text{ years.}$$

$$\text{Payback (B)} = 2 + \frac{\text{Rs. } 2{,}500}{\text{Rs. } 3{,}500} = 2.71 \text{ years.}$$

NPV

$$\text{NPV(A)} = -\text{Rs. } 10{,}000 + \frac{\text{Rs. } 6{,}000}{(1.12)1} + \frac{\text{Rs. } 4{,}000}{(1.12)2} + \frac{\text{Rs. } 3{,}000}{(1.12)3} + \frac{\text{Rs. } 1{,}000}{(1.12)}$$

$$= \text{Rs. } 1{,}317$$

$$\text{NPV(B)} = -\text{Rs. } 10{,}000 + \frac{\text{Rs. } 3{,}000}{(1.12)1} + \frac{\text{Rs. } 4{,}500}{(1.12)2} + \frac{\text{Rs. } 3{,}500}{(1.12)3} + \frac{\text{Rs. } 3{,}000}{(1.12)4}$$

$$= \text{Rs. } 664$$

Profitability Index (PI)

$$\text{PI(A)} = \frac{\text{PV of Inflows}}{\text{PV of Outflows}} = \frac{\text{Rs. } 11317}{\text{Rs. } 10{,}000} = 1.13$$

$$\text{PI(B)} = \frac{\text{PV of Inflows}}{\text{PV of Outflows}} = \frac{\text{Rs. } 10{,}664}{\text{Rs. } 10{,}000} = 1.06$$

IRR

To find out *IRR* for each project, determine the discount rates that set *NPV* to zero:

IRR (A) = 19.97%.
IRR (B) = 15.14%.

(ii) Using all methods, project A is preferred over project B. Since both projects are acceptable under the *NPV*, *PI*, and *IRR* criteria, both projects should be accepted if they are interdependent.

(iii) Choose the project with the higher *NPV* at $k = 12\%$, that is, project A.

10. The Blue Star Hotel is planning to take the nearby cafeteria on lease for 5 years. Also, available is the nearby canteen. Following are the projections for a five-year planning horizon:

	Cafeteria	Canteen
Cost	Rs. 2,000,000	Rs. 2,900,000
PV of expected cash flow@ k = 15%	2,500,000	3,600,000

(a) Calculate the NPV for each facility. Which is more desirable according to the NPV criterion?
(b) Calculate the PI for each facility. Which is more desirable according to the PI criterion?
(c) Under what conditions would either or both of the services be undertaken?

Solution:

(a) NPV

Cafeteria

$$\begin{aligned} \text{NPV} &= \text{PV Cash Flow} - \text{Outflow} \\ &= \text{Rs. } 2{,}500{,}000 - \text{Rs. } 2{,}000{,}000 \\ &= \text{Rs. } 500{,}000 \end{aligned}$$

Canteen

$$\begin{aligned} \text{NPV} &= \text{PV Cash Flow} - \text{Outflow} \\ &= \text{Rs. } 3{,}600{,}000 - \text{Rs. } 2{,}900{,}000 \\ &= \text{Rs. } 700{,}000 \end{aligned}$$

As NPV of canteen is higher than of cafeteria, so the cafeteria facility service is ranked ahead of the canteen as per the NPV criterion.

However, because NPV > 0 for each facility, both are acceptable and profitable.

(b) Profitability Index (PI)

$$\text{PI (Cafeteria)} = \frac{\text{PV of Inflows}}{\text{PV of Outflows}} = \frac{\text{Rs. 2,500,000}}{\text{Rs. 2,000,000}} = 1.25$$

$$\text{PI (Canteen)} = \frac{\text{PV of Inflows}}{\text{PV of Outflows}} = \frac{\text{Rs. 3,600,000}}{\text{Rs. 2,900,000}} = 1.24$$

As PI of Cafeteria is higher than of canteen, the cafeteria facility is ranked ahead of the canteen facility using the PI criterion.

However, because PI $>$ 0 for each facility, both are acceptable and profitable.

(c) If the company have relatively excessive capital resources, or at least Rs. 4,900,000 available for investment, both services should be initiated. However, in case of capital rationing where the capital resources are scarce, use of the PI criterion is a better choice as it results in adequate use of scarce funds for generating greater value. So, in this case, canteen facility sholud be selected though PI score of both facilities is marginally different.

11. Innovative Products, Inc. is considering two independent investments having the following cash flow streams:

Year	Project A	Project B
0	−Rs.50,000	−Rs.40,000
1	20,000	20,000
2	20,000	10,000
3	10,000	5,000
4	5,000	40,000
4	5,000	40,000

The company uses a combination of the NPV approach and the payback approach to evaluate investment alternatives. It requires that all

projects have a positive NPV when cash flows are discounted at 10 percent and that all projects have a payback period no longer than 3years. Which project or projects should the firm accept? Why?

Solution:

Payback period

Project A = 3 years; Project B = 3.15 years
Project B is unacceptable because its payback period is too long.

NPV

$$\begin{aligned}\text{NPVA} &= \text{Rs. } 50{,}000 + \text{Rs. } 20{,}000(0.909) + \text{Rs.}20{,}000(0.826) \\ &\quad + \text{Rs. } 10{,}000(0.751) + \text{Rs. } 5{,}000(0.683) + \text{Rs. } 5{,}000(0.621) \\ &= \text{Rs. } 1{,}270\end{aligned}$$

Project A is unacceptable because it fails to meet the NPV requirement. Therefore, neither project should be undertaken by the company.

12. HT appliances are considering the purchase of a new computer network for the company's office staff. The existing computer equipment can be sold for a total of Rs. 5,000. It was purchased four years back for Rs. 90,000 and was being depreciated over a five-year period using the straight-line method (SLM). The new computer equipment will cost a total of Rs. 75,000. It requires Rs. 3,000 in working capital to support the new equipment's operation. The equipment will be depreciated over a five-year period using SLM and will have a zero expected salvage value.

The annual savings are expected to be Rs. 20,000 per year for each year of the equipment's expected five-year life.

The cost of capital is14% for the project with a tax rate of 35%.

From the above:

a. Determine the cash outflows associated with the equipment.
b. Determine the cash inflows (after depreciation and taxes) associated with the new equipment.

c. Determine the NPV, the PI, the IRR, and the payback period of the proposed project.

Solution:

The cash outflows of the new computer network are:

Cost of new asset	Rs. 75,000
Working capital	3,000
Sale proceeds of the old asset	(5,000)
Tax on Sale of Old Asset	**1750**
Present value of the Cash Outflows	Rs.74,750

The cash inflows are:

Year 1	Rs. 18,250
Year 2	18,250
Year 3	18,250
Year 4	18,250
Year 5	18,250

At 14%, the present value of these cash inflows is Rs.62,654.
The NPV of the new computer network is (Rs.12,096).
The PI is 0.84.
The IRR is 7%.
The payback period is 3.25 years.

13. White Inc. just constructed a manufacturing plant in Ghana. The construction cost is 9 billion Ghanaian cedi. Mr. White intends to use the plant for 3 years. During the 3 years of operation, cedi cash flows are expected to be 3 billion cedi, 3 billion cedi, and 2 billion cedi, respectively. Operating cash flows will begin 1 year from today and are remitted back to the parent at the end of each year. At the end of the third year, Mr. White expects to sell the plant for 5 billion cedi. The required rate of return is 17%. It currently takes 8,700 cedi to buy one U.S. dollar, and the cedi is expected to depreciate by 5 percent per year.

(a) Determine the NPV for this project. Should Mr. White build the plant?

(b) How would your answer change if the value of the cedi was expected to remain unchanged from its current value of 8,700 cedis per U.S. dollar over the course of the three years? Should Mr. White construct the plant then?

Solution:

(a)

Cash Flows:				
Year	0	1	2	3
Investment	−9			
Operating CF		3	3	2
Salvage Value				5
Net CF	−9	3	3	7
Exchange rate	8,700	9,135	9,592	10,071
Cash flows to parent	−$1,034,483	$328,407.23	$312,760.63	$695,065.04
PV of parent cash flows	−$1,034,483	$280,689.94	$228,475.88	$433,978.15
NPV	−$1,034,483	−$753,793.06	−$525,317.18	−$91,339.03

Since the project has a negative NPV, Mr. White should not undertake it.

(b)

If the cedi was expected to remain unchanged from its current value of 8,700 cedis per U.S. dollar over the course of the three years:

Year	0	1	2	3
Investment	−9			
Operating CF		3	3	2
Salvage Value				5
Net CF	−9	3	3	7
Exchange rate	8,700	8,700	8,700	8,700
Cash flows to parent	−$1,034,483	$344,827.59	$344,827.59	$804,597.70
PV of parent cash flows	−$1,034,483	$294,724.44	$251,901.23	$502,367.11
NPV	−$1,034,483	−$739,748.56	−$487,847.33	+$14,519.78

If the value of the cedi remains constant, the NPV is positive. Thus, Mr. White should undertake the project in this case. Of course, the NPV is only slightly positive. Whether or not Mr. White actually undertakes the project depends on the confidence it has in its exchange rate forecasts.

14. A project in South Korea requires an initial investment of 2 billion South Korean won. The project is expected to generate net cash flows to the subsidiary of 3 billion and 4 billion won in the 2 years of operation, respectively. The project has no salvage value. The current value of the won is 1,100 won per U.S. dollar, and the value of the won is expected to remain constant over the next two years.

What is the NPV of this project if the required rate of return is 13 percent?

Solution:

(a)

Year	0	1	2
Investment	−2		
Operating CF		3	4

Net CF	−2	3	4
Exchange rate	1,100	1,100	1,100
Cash flows to parent	−$1,818,181.82	$2,727,272.73	$3,636,363.64
PV of parent cash flows	−$1,818,181.82	$2,413,515.69	$2,847,806.12
NPV	−$1,818,181.82	+$595,333.87	−$3,443,139.99

The NPV is $3,443,139.99.

15. Bulls Inc. considers a project in which it will sell the use of its technology to firms in Mexico. It already has received orders from Mexican firms that will generate MXP3,000,000 in revenue at the end of the next year. However, it might also receive a contract to provide this technology to the Mexican government. In this case, it will generate a total of MXP5,000,000 at the end of the next year. It will not know whether it will receive the government order until the end of the year.

Today's spot rate of the peso is $.14. The one-year forward rate is $.12. Bulls expects that the spot rate of the peso will be $.13 1 year from now. The only initial outlay will be $300,000 to cover development expenses (regardless of whether the Mexican government purchases the technology). It will pursue the project only if it can satisfy its required rate of return of 18%. Ignore possible tax effects. It decides to hedge the maximum amount of revenue that it will receive from the project.

Determine the NPV if Bulls receive the government contract.

Solution:

$$\text{Revenue converted to \$} = \text{MXP5,000,000} \times \$.12 = \$600{,}000$$

$$\text{NPV} = \$600{,}000/(1.18) - \$300{,}000 = \$208{,}475$$

Bibliography

Archer, S.H., et al. 1972. *Business Finance—Theory and Management*. New York: Macmillan.

AS–6. November, 1982. *Depreciation Accounting*. New Delhi: The Institute of Chartered Accountants of India, para 3.1.

Anthony, R.N., et al. 1975. *Principles of Management Accounting*. Illinois: Richard Irwin.

Batty, J. 1966. *Management Accountancy.* London: MacDonald and Evans.

Bierman H., Jr., et al. 1986. *Financial Management for Decision Making*. New York: Macmillan.

Brigham, E.F., et al. 1997. *Financial Management: Theory and Practice.* 8th ed. Florida: Dryden Press.

Chenhall, R.H., and Morris, D. 1993. "The Role of Post Completion Audits, Managerial Learning, Environmental Uncertainty and Performance." *Behavioral Research in Accounting* 5, pp. 171–86.

Dean, J. 1951. *Capital Budgeting*. New York: Columbia University Press.

Dewing, A.S. 1914. *Corporate Promotions and Re-organisations*. Cambridge, Massachusetts: Harvard University Press.

Donaldson, E.F., et al. 1975.*Corporate Finance*. 4th ed. New York: Ronald Press.

Donaldson, G. January-February, 1960. "Looking Around: Finance for the Non-Financial Managers." *Harvard Business Review* 37, p. 33.

Donaldson, G. 1961. *Corporate Debt Capacity.* Boston Division of Research: Harvard Business School.

Eiteman, W.J., et al. 1953. *Essays on Business Finance*. Ann Arbor, Michigan: Masterco Press.

Emery, D.R., et al. 1998. *Principles of Financial Management*. New Jersey: Prentice Hall.

Finney, H.A., et al. 1972. *Principles of Accounting—An Introduction.* Japan: Prentice Hall, p.287.

Foulke, R.A. 1979. *Practical Financial Statement Analysis*. New Delhi: Tata McGraw Hill.

Gitman, L.J. 1976. *Principles of Managerial Finance*. New York: Harper & Row.

Guthmann, H.G., et al. 1962. *Corporate Financial Policy*. 4th ed. New Jersey: Prentice Hall.

Guthmann, H.G. 1968. *Analysis of Financial Statements*. New Delhi: Prentice Hall.

Kennedy, R.D., et al. 1968. *Financial Statements: Form, Analysis and Interpretation*. Illinois: Richard D. Irwin.

Lev, B. 1974. *Financial Statement Analysis—A New Approach*. New Jersey: Prentice Hall.

Markowitz, H. "Portfolio Selection." *Journal of Finance,* Vol. 7, No. 1, March 1952, pp. 77–91.

Miller, M.H., et al. October, 1961. "Dividend Policy, Growth and the Valuation of Shares." *Journal of Business* 34, pp. 411–433.

Modigliani, F., et al. June, 1958. "The Cost of Capital, Corporation Finance and the Theory of Investment." *American Economic Review* 48, pp. 261–297.

Moyer, C.R., et al. 1981. *Contemporary Financial Management*. New York: West Publishing.

Sharpe, W.F. September, 1964. "Capital Asset Prices: A Theory of Market Equilibrium under Conditions of Risk." *Journal of Finance* 19, pp. 425–442.

Smith, K.V. 1974. *Management of Working Capital*. New Delhi: West Publishing.

Solomon, E. 1969. *Theory of Financial Management.* New York: Columbia University Press.

Spiller, E.A. 1977. *Financial Accounting*. Homewood, Illinois: Richard D. Irwin.

Van Horne, J.C., et al. 1996. *Fundamentals of Financial Management*. 9th ed. New Delhi: Prentice Hall.

Walter, J.E. May, 1963. "Dividend Policy: Its Influence on the Value of the Enterprise." *Journal of Finance,* pp. 280–291.

Westwick, C.A. 1973. *Management: How to Use Ratios.* Essex: Gower Press, p.5.

Wright, M.G. 1973. *Discounted Cash Flow*. Maidenhead: McGraw Hill.

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Capital Budgeting

Sandeep Goel

Capital budgeting is an important part of the financial management of a business organization. It is a process that business houses use to evaluate an investment project. The decision of whether to accept or deny an investment project is capital budgeting decision. Capital budgeting is important because it determines the long-term economic and financial profitability of any investment project. It lays down the future success of a business. *Capital Budgeting* aims to develop not only an understanding of the concepts of capital budgeting but also to provide its practical application to help students learn both theory and practice of capital budgeting used in the financial management of a business organization. It analyzes the capital budgeting practices of corporate enterprises in India in diverse sectors, on comparative basis, in order to provide the reader a better insight into the various issues and challenges regarding capital budgeting management.

Dr. Sandeep Goel is a professor of accounting and finance at Management Development Institute, Gurgaon. He holds 'double doctorate', one in finance and another in accounting, from Faculty of Management Studies (FMS), University of Delhi. He did his honors in commerce from Shri Ram College of Commerce, University of Delhi and master's degree in commerce with specialization in finance from Delhi School of Economics, University of Delhi.

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