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MGT201

Financial Management

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Financial Management

Table of Contents

1. Introduction to financial management
2. Objectives of financial management, financial assets and financial markets
3. Analysis of financial statements
4. Time value of money
5. Financial forecasting & financial planning
6. Present value and discounting
7. Discounted cash flow analysis, annuities and perpetuities
8. Capital budgeting and capital budgeting techniques
9. Net present value & internal rate of return
10. Project cash flows, project timing, comparing projects and modified internal rate of return
11. Some special areas of capital budgeting
12. Capital budgeting and interpretation of IRR and NPV with limited capital
13. Bonds and classification of bonds
14. Bonds valuation
15. Bond valuation & yield on bonds
16. Introduction to stocks and stock valuation
17. Common stock pricing and dividend growth model
18. Common stock - rate of return & EPS pricing model
19. Introduction to risk, risk and return for single stock investment
20. Risk for single a stock investment probability graph and co-efficient of variation
21. Two stock portfolio theory, risk and expected return
22. Portfolio risk analysis and efficient portfolio maps
23. Efficient portfolios, market risk, & CML
24. Stock beta, portfolio beta and introduction to security market line (SML)
25. Stock betas & risk, SML and return and stock prices in efficient markets
26. SML graph & CAPM
27. Risk and portfolio theory & CAPM, criticism of CAPM and application of risk theory.
28. Introduction to debt, efficient market & cost of capital
29. WACC (Weighted Average Cost of Capital)
30. Business risk faced by firm, operating Leverage (OL), break-even point & ROE
31. Operating leverage and financial leverage, ROE, break even point and business risk
32. Financial leverage and capital structure
33. Modifications in Millar Modigliani capital structure theory
34. Application of Millar Modigliani and other capital structure theories
35. Net income & tax shield approaches to WACC
36. Management of capital structure
37. Dividend payout
38. Application of residual dividend model

- 39. Working capital management
- 40. Cash management & working capital financing
- 41. Short term financing, long term financing and lease financing
- 42. Lease financing and types of lease financing
- 43. Mergers & acquisitions
- 44. International finance (Multinational Finance)
- 45. Final review of entire course of financial management

INTRODUCTION TO FINANCIAL MANAGEMENT**Learning objectives:**

The purpose of this lecture is to provide you with an overview of financial management. After finishing this lecture, you would be able to have a better understanding of the following.

- **Definition of financial management**
- Significance of financial management for non-finance students and professionals
- Important concepts and areas in financial management
- The position of financial managers in organizational hierarchy and their respective work domains.
- Different business legal entities, their advantages and limitations.
- The external and internal business environments and their relevance to financial management.
- Different types of financial and real assets markets.

What is FM?

FM is the management of financial resources – how to best find and use investments and financing opportunities in an ever-changing and increasingly complex environment.

Why should CS majors study FM?

First of all, financial management is a core life skill; almost every one needs to understand some concepts of finance to manage his/her business & personal finances.

It is generally and quite rightfully said, “Money makes the world go round”. Finance is like a life-blood for a company. Even the best of the companies and CEOs go out of the business because of poor financial management policies.

Management Information Systems (MIS) and Information Technology (IT) are just a part of the overall corporate strategy which runs on finances, the major resource. So the computer sciences professionals need to have an understanding of the financial concepts to understand and contribute to the overall corporate strategy.

Financial Engineering is an upcoming field that requires people with CS, math/science, and finance background. Financial engineering is the application of engineering methods to finance. One important area of study is the design, analysis, and construction of financial contracts to meet the needs of enterprises. This field is experiencing an increased demand for professionals, especially those who are trained in both the underlying mathematics/computer technologies and finance.

Definitions**Finance:**

Finance is the science of managing financial resources in an optimal pattern i.e. the best use of available financial sources. Finance consists of three interrelated areas:

- 1) Money & Capital markets, which deals with securities markets & financial institutions.
- 2) Investments, which focuses on the decisions of both individual and institutional investors as they choose assets for their investment portfolios.
- 3) Financial Management, or business finance which involves the actual management of firms.

Major Areas & Concepts of Financial Management

Following are some of the important areas and concepts of financial management, which would be discussed in detail in the lectures to come.

■ Analysis of Financial Statements:

Analysis of financial statement is one of the most common techniques of financial analysis, in which the financial performance and financial health of a company are analyzed based on its past performance.

The following financial statements are used in the analysis process.

- **Profit & Loss Statement or Income Statement**

Income statement reflects the operating efficiency or profitability of a company as a result of its operations along with the net profit available to the shareholders for a given year (usually one accounting period). This statement provides the analyst with some insight into the financial performance of the company.

- **Balance Sheet**

Balance Sheet is a snap-shot of an organization's financial health at a particular time. It shows what assets are owned by the business and the sources of acquiring these assets.

- **Statement of Shareholders' equity**

Statement of shareholders' equity provides the share of the owners in the business.

- **Statement of Cash Flows**

Statement of cash flows explicitly reflects the cash movement (inflows and outflows) during the operations in an accounting period.

Taken together, these statements give an accounting picture of the firm's operations and financial position. Financial statements report what has actually happened to the assets, earnings, and dividends over the years. The analysis of the information contained in these statements help management of the organization to evaluate the performance and activities of the concern; it also helps the investors and creditors to have an idea of the profitability potential and creditworthiness of the business.

- **Investment Decisions & Capital Budgeting:**

Investment decisions are the most critical as they usually involve huge sums of money and these decisions are likely to bring prosperity or doom to a business. A company's future income depends on how much investment is made, in what type of assets, and how these assets add to the overall value of the company.

Capital budgeting is a term strictly related to investment in fixed assets; here, the term capital refers to the fixed assets that are used in production, while budget is a plan which details projected cash inflows and outflows over some future period. The following concepts and techniques are employed while analyzing investment decisions.

- Interest rate formulas
- Time Value of Money
- Discounted Cash Flows
- Net Present Value
- Internal Rate of Return

- **Risk & Return:**

Investors, individual or institutional, invest their money with the expectations of earning a return on their investment. While investors wish and attempt to earn maximum return, they are constrained by risk. How the risks and returns are related and how do investors make a choice of their portfolios is important for investment decision making. Following concepts and theories would be discussed while discussing the risk-return choices of the investor:

- Uncertainty
- Risk
- Portfolio Theory
- Capital Asset Pricing Model

- **Corporate Financing & Capital Structure:**

When a firm plans to expand, it needs capital or funds. Acquisition of funds is considered to be a primary responsibility of a finance department in an organization. There are numerous ways to acquire funds, i.e., finances can be raised in the form of debt or equity. The proportion of debt and equity constitutes the capital structure of the firm. Financial experts attempt to find a combination of debt and equity that could increase the overall value of the company, i.e., they try to find the optimal capital structure. The following concepts would be used to understand how an optimal capital structure could be attained.

- Cost of Capital
- Leverage
- Dividend Policy
- Debt Instruments

- **Valuation:**

Asset or company valuation is important not only for financial managers, but also for creditors and investors. It is important to know the value of the company or its assets to make

important financing and investment choices. Different valuation techniques and factors that influence the value of a company or its financial instruments would be discussed in this section.

- Share
- Bond
- Option
- Corporate

▪ **Working Capital & Inventory Management:**

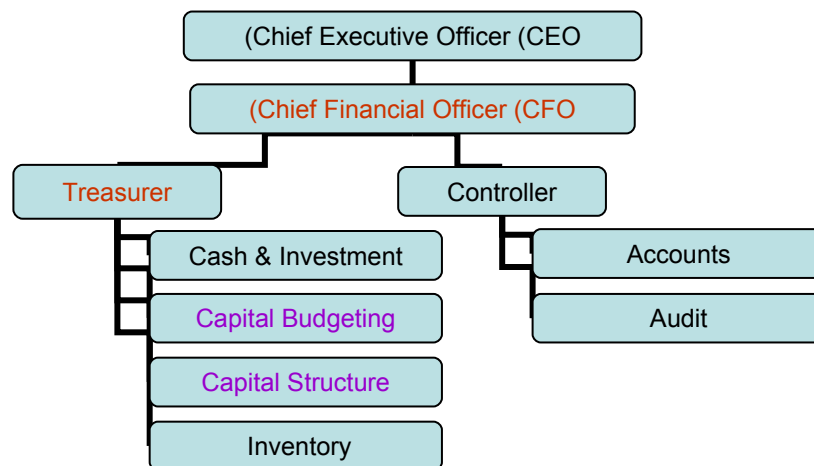
Working capital and inventory management pertains to the effective management of current assets. As we will see, an optimal and effective utilization of working capital and inventory increases the operating efficiency of the firm.

▪ **International Finance & Foreign Exchange:**

With the increasing importance of international trade and global markets, the role of international finance has increased manifold. In a global environment, the finance managers have more choices pertaining to investing and financing than ever before. However, it is important to understand the implications of working in a global environment, since fluctuations in the currency rates can convert a good financing or investment decision into a bad one. This section of the course would discuss the international financial environment and the financial implications of working in a global environment.

Organizational Structure

(Who does the FM work?)



Business Legal Entities

• **Sole Proprietorship :**

It is an unincorporated business owned by one individual. Going into a business as a sole proprietor is simple – one merely has to begin business operations. Proprietorship consists of 80% of the total number of businesses worldwide.

Advantages:

- i. It is easily & inexpensively formed.
- ii. It is subject to few government regulations.
- iii. The business pays no corporate income tax; only personal income tax is paid by the proprietor.

Limitations:

- i. It is difficult for a proprietorship to obtain large sums of capital.
- ii. The proprietor has unlimited personal liability for the business debts, which can result in losses that exceed the money invested by him in the business.
- iii. The life of the business organized as proprietorship is limited to the life of the individual who created it.

Partnership:

A partnership exists whenever two or more persons associate to conduct a non-corporate business. It could be registered or unregistered.

Advantages:

- i. Low cost involved
- ii. Ease of formation.

Limitations:

- i. Unlimited Liability.
- ii. Limited life of the organization.
- iii. Difficulty of transferring ownership.
- iv. Difficulty of raising large amounts of capital.

Corporation:

A corporation is a limited company and a separate legal entity registered by the government. It is separate & distinct from its owners & managers. It can be Private Limited (Pvt. Ltd.) or Public Limited (which may be listed on Stock Exchange). The businesses in the form of corporations control 80% of global sales of products and services.

Advantages:**i- Unlimited life:**

A corporation can continue even after the death of its original owners.

ii- Easy transferability of ownership interest:

Ownership interests can be divided into shares of stock, which in turn can be transferred far more easily than can proprietorship & partnership interests.

iii- Limited Liability:

The liability of the shareholders is limited up to the extent of nominal value of shares held by them. Creditors and banks cannot confiscate personal properties of director & shareholders in case of its bankruptcy.

Limitations:

- i. Double Taxation:
Corporate earnings may be subject to double taxation – the earnings of the corporation are taxed at corporate level, and then any earnings paid out as dividends are taxed again as income to the stockholders.
- ii. Legal Formalities:
Setting up a corporation, and filing many official documents, is more complex and time consuming than for a proprietorship or a partnership

- **Hybrids (Mixed):**

Hybrid organizations are specialized types of partnerships, which combine the limited liability advantage of a corporation with the tax advantages of a partnership.

S-Type Corporation:

S-Type corporations are Limited Liability Corporations without double taxation. In a regular corporation, the company itself is taxed on business profits. In addition, the owners pay individual income tax on money that they draw from the corporation as salaries, bonuses, or dividends. In contrast, in an

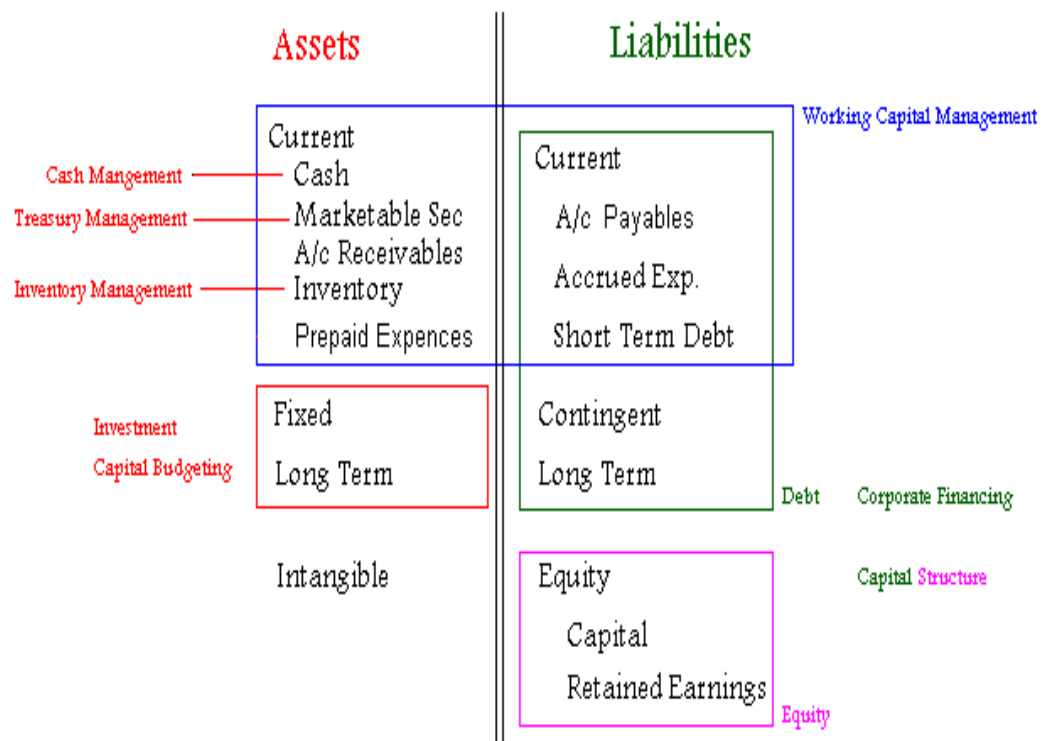
S corporation, all business profits "pass through" to the owners, who report them on their personal tax returns (as in sole proprietorships, partnerships, and Limited Liability Companies). The S corporation itself does not pay any income tax, although a co-owned S corporation must file an informational tax return like a partnership or Limited Liability Companies – to tell the tax authorities what each shareholder's portion of the corporate income is.

LLP:

Limited Liability Partnership (LLP) is also a form of partnership with allows limited liability to the owners and avoids double taxation. These organizations are similar in many ways to the S Corporations; however, LLPs offer more flexibility and benefits to the owners.

PC:

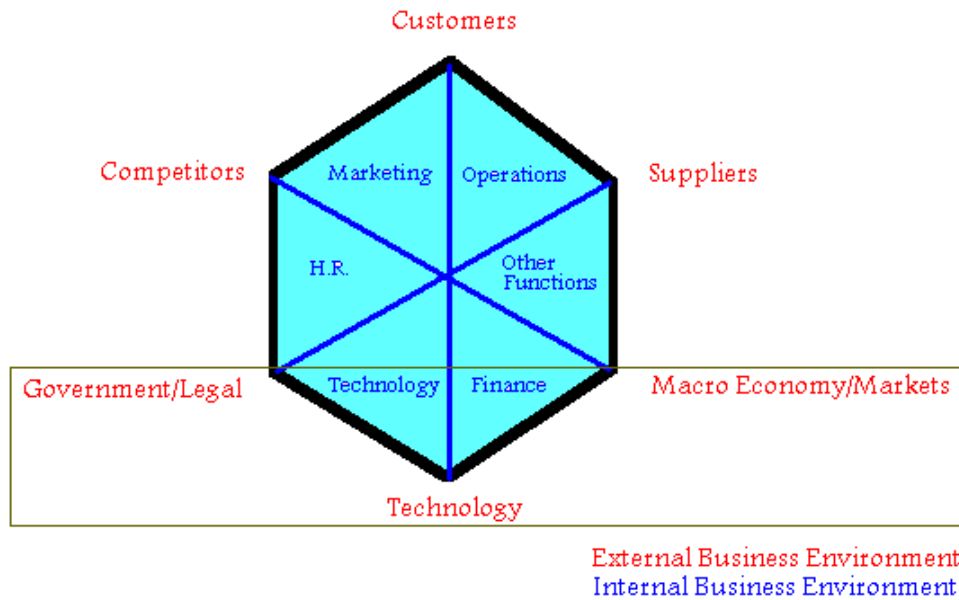
Personal Corporations (PC) or Professional Corporations are generally formed by professionals to protect them against litigations. Professionals like doctors, lawyers and accountants prefer to register their business as Professional Corporations.

Balance Sheet – An FM Perspective

Note: FM uses market value basis unlike Financial Accounting which generally uses historical basis.

Internal and External Business Environment

Role of Finance, Technology, Government, and Macro Markets



Internal Business Environment:

Internal environment of business normally consists of the following.

- i. Finance
- ii. Marketing
- iii. Human Resources
- iv. Operations (Production, Manufacturing)
- v. Technology
- vi. Other Functions (Logistics, Communications)

External Business Environment:

The following business environment factors outside an organization have a profound effect on the functions and operations of an organization.

- i. Customers
- ii. Suppliers
- iii. Competitors
- iv. Government/Legal Agencies & Regulations
- v. Macro Economy/Markets:
- vi. Technological Revolution

An analysis which is used in a business is called **SWOT** Analysis. SWOT is an acronym where

- S** stands for Strengths
- W** stands for Weaknesses
- O** stands for Opportunities
- T** stands for Threats

Strengths and weaknesses are within an organization, i.e., they pertain to the internal environment of the organization.

Opportunities and threats, on the other hand, pertain to the external environment, i.e., outside the organization.

Financial Markets

- **Capital Markets:**

These are the markets for the long term debt & corporate stocks.

Stock Exchange:

A stock exchange is a place where the listed shares, Term finance certificates (TFC) and national investment trust units (NIT) are exchanged and traded between buyers and sellers.

Long term bonds:

Long term government & corporate bonds are also traded in capital markets.

- **Money Markets**

Money market generally is a market where there is buying and selling of short term liquid debt instruments. (Short term means one year or less). Liquid means something which is easily en-cashable; an instrument that can be easily exchanged for cash. Following financial instruments are traded in money markets.

Short term Bonds

- Government of Pakistan: Federal Investment Bonds (FIB), Treasury-Bills (T-Bills)
- Private Sector: Corporate Bonds, Debentures

Call Money, Inter-bank short-term and overnight lending & borrowing

Loans, Leases, Insurance policies, Certificate of Deposits (CD's)

Badlah (money lending against shares), Road-side money lenders

- **Real Assets or Physical Asset Markets**

Following are the active markets of real and physical assets in Pakistan

- Cotton Exchange, Gold Market, Kapra Market
- Property (land, house, apartment, warehouse)
- Computer hardware, Used Cars, Wheat, Sugar, Vegetables, etc.

OBJECTIVES OF FINANCIAL MANAGEMENT, FINANCIAL ASSETS AND FINANCIAL MARKETS

Learning objectives:

After going through this lecture, you would be able to have a better understanding of the following concepts.

- Objectives of financial management as compared to Economics and Financial Accounting
- Real and Financial assets
- Different types and characteristics of financial assets and the similarities and differences among them
- How these financial assets are reported in the balance sheet of a company
- Concept of Value and different kinds of Value
- Types of financial and real assets markets

While studying the course of financial management, we will study, in detail, two important areas of financial management, known as:

1. Investments & Capital budgeting
2. Corporate financing.

Concepts such as interest, time value of money, cash flows, risk & return, cost of capital, leverage, financing would be thoroughly discussed. In the later lectures, we will talk about some specialized areas of finance like international finance & working capital finance.

In the previous lecture, we had discussed the overall organizational hierarchy, and the hierarchy of the finance department – the people responsible for the financial management functions. Furthermore, the different types of business legal entities and their salient characteristics were also discussed.

In this lecture, we would discuss the differences that exist among Financial Management, Economics & Financial Accounting disciplines.

- **Objective of Economics:**
The objective of economics, as a subject, is profit maximization; however, the scope of economic profit maximization is vast and loosely defined. In economics, we can talk about profit maximization for an individual, the whole society, or a particular class or group. We can also talk about profit maximization for the whole world in global terms. In social economics, we may study the social profit maximization for the societies, whereas, in capitalistic economics we may study individual or company's profit.
- **Objective of Financial Management (FM)**
In comparison, financial management is more focused. The objective of financial management, specifically, is to maximize the shareholders wealth in the present terms. Financial practitioners usually use the discounting and the net present value techniques while calculating the increase in the wealth of shareholders.
- **Objective of Financial Accounting (FA):**
The objective of financial accounting is to collect accurate, systematic, and timely financial data and other financial information, and to compile and consolidate it in an organized and systematic way, according to the principles and rules of accounting, for reporting purpose. The financial managers use these reports to assess the financial position of the company through various financial management tools and then the financial position can be compared to, or benchmarked against, the industry norms. The four different financial statements used for the purpose of reporting and analysis are
 1. Balance Sheet
 2. P/L or Income Statement
 3. Cash Flow Statement
 4. Statement of Retained Earnings (or Shareholders' Equity Statement)

In financial accounting, assets are recorded on the basis of historical costs in the balance sheet, i.e., the assets are recorded at their original purchase price. Of course, the depreciation on the asset is duly subtracted from its original value as the asset remains in use of the business.

However, in financial management, book value is seldom used and financial managers consider the market value and the intrinsic value of assets.

Market value may be defined as the value currently prevailing in the market or the value at which the sellers are ready to sell, and buyers are ready to buy a particular asset.

Intrinsic value or the *fair value* is calculated by summing up the discounted future cash flows.

In Financial accounting, we followed the principle of accrual accounting in which expenses & incomes are rerecorded when they incur. In Financial management, we will primarily be interested in cash & cash flows. In Financial management, we will use cash as primary source for calculating value, although the accrual data would also be useful for analyzing a firm's financial position.

Before getting into details, it is important to understand a few concepts that would be frequently used throughout the course.

Real Assets:

Real assets are tangible assets that have physical characteristics. For instance, land, house, equipment, car, wheat, fruits, cotton, computers, etc., are different kinds of real assets.

Securities:

Security, also known as a financial asset, is a piece of paper representing a claim on an asset. Securities can be classified into two categories.

- **Direct Securities:** Direct securities include stocks and bonds. While valuing direct securities we take into account the cash flows generated by the underlying assets. Discounted Cash Flow (DCF) technique is often used to determine the value of a stock or bond.
- **Indirect Securities:** Indirect securities include derivatives, Futures and Options. The securities do not generate any cash flow; however, its value depends on the value of the underlying asset.

While in this course, direct securities would be discussed at length, the indirect securities would only be skimmed through in the later chapters.

Bonds:

Bonds represent debt. The important features of bonds are given as under.

- Internationally, bonds are the most common way for companies to raise funds.
- A bond is a long-term debt contract (on paper) issued by the borrower (Issuer of the Bond i.e., a company that wishes to raise funds) to the lenders (bondholders or Investors which may include banks, financial institutions, and private investors).
- Bonds issued by a company are usually shown on the liabilities side of the Balance Sheet.
- A Bond requires the borrower to pay a pre-determined amount of interest regularly to the lender (bondholder). The interest rate or the rate of return on a bond can be Fixed or Floating. If an investor purchases a bond which is offering a rate of 10 % for the life of the bond, the rate would be fixed at 10 percent. However, if the interest rate on the bond is tied to the market interest rates, the rate of interest would be floating. The floating rate implies that the interest rate would fluctuate with any change in the market interest rate.

Types of Bonds:

- Debentures: Unsecured – no asset backing
- Mortgage Bond: Secured by real property i.e. Land, house
- Others: Eurobond, Zeros, Junk, etc.

The details on these different types of bonds would be discussed in later lectures.

Stocks (or Shares):

Stocks (or Shares) are paper certificates representing ownership in a business. Therefore, if a company has issued 1 million shares and an investor owns 1 share only, he is a part owner (or shareholder) of the company. Stocks or shares are represented in the equity section of the balance sheet. A stock certificate is perpetuity, i.e., it lasts as long as the company does. Shareholders have a residual claim (last claim) on whatever net income (or profit) and assets are left over after the bondholders have been fully paid off. It is the most common source of raising funds under Islamic Shariah. Shares are traded in Stock market e.g. Karachi Stock Exchange (KSE), Lahore Stock Exchange (LSE) & Islamabad Stock Exchange (ISE).

Difference between Shares & Bonds:

The main difference between shares and bonds is that shares are representation of ownership in a company while bonds are not representative of ownership.

The second difference is that shares last as long as the company lasts where as bonds have limited life.

Another difference is that the return on a bond is predetermined, i.e., the investor knows in advance how much return he would get from a bond. However, a stockholder cannot be certain about the return on a stock investment, since the dividends may or may not be paid in a certain year or the percentage of dividends announced may vary.

Types of Stocks (or Shares):

Common Stock:

Common shareholders receive dividends, or portion of the net income which the management decides, NOT to reinvest into the company in the form of retained earnings. Dividends are paid in proportion to the number of shares the stockholders own and are announced by the board of directors, who may opt not to announce a dividend in a particular year. Common Stockholders have voting rights to elect the board of directors.

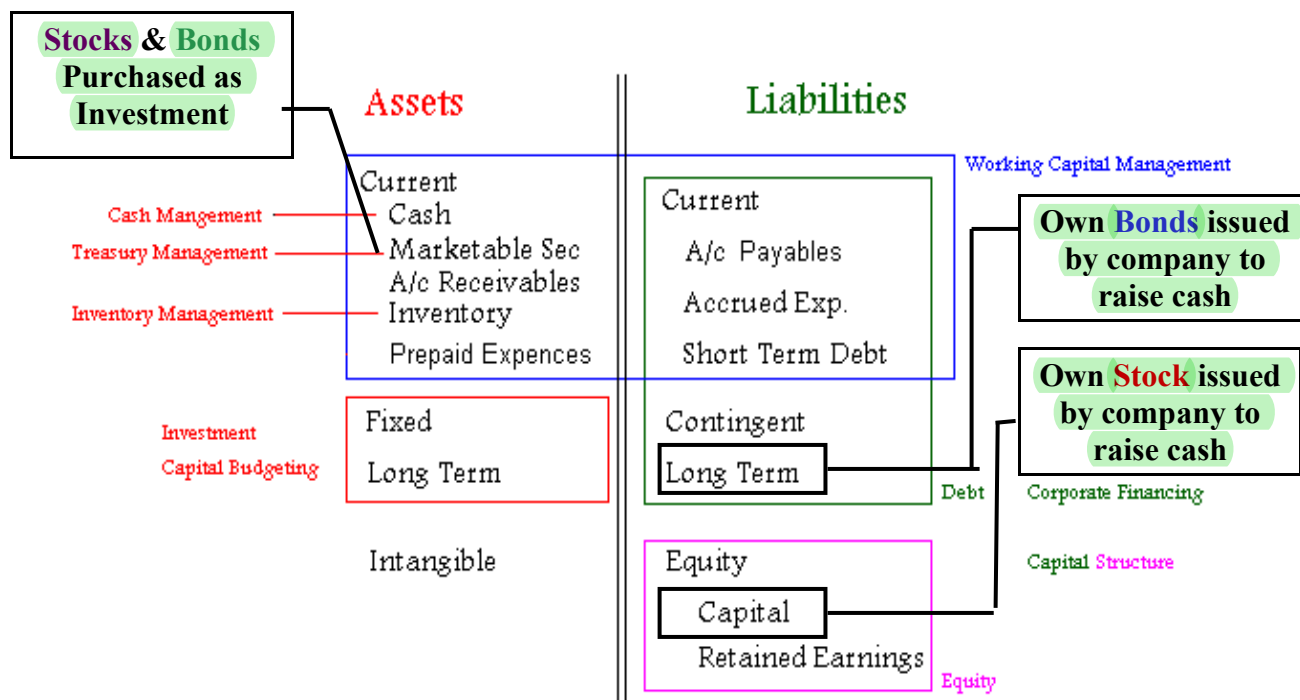
Preferred Stock:

It is the stock with a predetermined or fixed dividend. In case, the board of directors announces dividends, the preferred stockholders would have a priority claim on them, i.e., they would be paid dividends before any dividends are paid to the common stockholders. However, if the board opts to retain earnings, the preferred stock would not yield a dividend, and thus cash flows from a preferred dividend are not as certain as income of the bondholders.

Dividends are paid out of net income. Shareholders get a part of the net profit of the company during the year, proportional to their shareholdings, and it is for the management to decide how much of the profit is to be distributed among the shareholders.

Now, we will see how these shares and bonds will appear on the face of a balance sheet. We will have to look at these shares and bonds from two aspects, the shares and bonds that the company issues and the shares and bonds that company invest in. The shares and bonds that a company purchases as an investment will come on the asset side under the section of marketable securities. These shares and bonds have been purchased by the company to generate extra income. On the other hand, those shares and bonds that the company issues to raise funds will appear on the liability side.

If the company has issued bonds, they will be classified as liability. But if the company has issued equity shares, they will appear under the section of common equity on liability side in the balance sheet. Where do bonds & stocks appear on the Balance Sheet?



Note: FM uses market value basis unlike Financial Accounting which generally uses historical basis.

Finally, let's talk about the most important concept that we will keep on repeating throughout the course; the concept of 'value'. In financial terms, there are different types of values, which are given as under.

Value

- **Book Value:**

Book Value is the value of an asset as shown on the Balance Sheet. It is based on historical cost (or purchase price) and accumulated depreciation.

- **Market Value:**

Market value of an asset is as quoted in the market, which basically depends on the supply & demand of the asset and the negotiations between buyers & sellers.

- **Liquidation Value:**

The liquidation value is the value of an asset in a particular situation, where the company is in the process of wrapping up the business and its assets are valued and sold individually.

- **Fair Value or Intrinsic Value:**

The most important value concept in this course is of fair value or the intrinsic value. In order to find the intrinsic value of an asset, the present value of the working assets' future cash flows is calculated and summed up. If the intrinsic value of an asset is less than its market value, the asset among investors is perceived as "undervalued".

Financial Markets

- **Capital Markets:**

These are the markets for the long term debt & corporate stocks. The maturity of debt should be more than one year to qualify it as a capital market instrument.

- **Stock Exchange:**

A stock exchange is a place where the listed shares, Term finance certificates (TFC) and national investment trust units (NIT) are exchanged and traded between buyers and sellers.

- **Long term bonds:**

Long term government & corporate bonds are also traded in capital markets.

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- Property (land, house, apartment, warehouse)
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ANALYSIS OF FINANCIAL STATEMENTS**Learning Objectives:**

After going through this lecture, you would be able to have a better understanding of the following concepts.

- **Analysis of Financial Statements**
- **Key Financial Ratios**
- **Limitation of Financial Statements Analysis**
- **Market value added & Economic value added.**

You have studied in previous lecture

- **Objective of Economics:**
The objective of economics is profit maximization, however, for whom the profit is to be maximized and for what duration may vary.
- **Objective of Financial Accounting (FA):**
The objective of financial accounting is to record accurate, timely, consistent, and generalized collection of financial data, consolidating the information and reporting it to the management for decision-making. Nevertheless, the decision-makers use financial management techniques for a useful interpretation of the consolidated financial data.
- **Objective of Financial Management (FM):**
The objective of financial management is to maximize the wealth of the shareholders/owners. One way of increasing shareholders' wealth is by maximizing the stock price. In financial management when we talk about the profit maximization, we actually imply profit maximization for the shareholders of the company. We can simply measure it from the share price of the company in the market.
Another way is to find the best investment and financing opportunities in order to maximize the value of the company. As we will see in the later lectures, the two ways are closely related to each other. Financial statements are used to assess the financial position as well as performance of the company, so that the financing and investing decisions could be taken accordingly.

Analysis of Financial Statements:

A company's financial statements need to be studied for signs of financial strengths and weaknesses and then compared to (or benchmarked against) the industry. Before getting into the details of the financial management techniques, we would briefly revise some of the accounting concepts, which are going to help us in comprehending those analysis techniques.

Basic Financial Statements:

There are four basic financial statements that are prepared by the financial accountants for the use of the managers, creditors and investors of the company. These statements are

- a. Balance Sheet
- b. P/L or Income Statement
- c. Cash Flow Statement
- d. Statement of Retained Earnings (or Shareholders' Equity Statement)

The concepts that we are going to discuss here in reviewing financial accounting concepts are Fundamental Accounting Equation and Double Entry Principle.

- $\text{Assets} + \text{Expense} = \text{Liabilities} + \text{Shareholders' Equity} + \text{Revenue}$
(Note: Expense & Revenue are Temporary P/L accounts – the others are Permanent Balance Sheet Accounts)
- Left Hand Items increase when debited. Right Hand items increase when credited.
- For every journal entry, the Sum of Debits = the Sum of Credits

Balance Sheet:

The following facts about balance sheet are also going to help us in understanding the financial statements analysis process.

- A balance sheet is a 'static snapshot' at one point in time (therefore the consolidated data available is vulnerable to inventory and cash swings, i.e., if the balance sheet of a firm is showing low inventory and high cash position at the year ending when the

balance sheet is prepared, the company may buy excessive inventory against cash the very next day. The balance sheet prepared a day earlier would not report the new transaction and the latest financial position of the company would not be known to the analyst, unless the company updates him on that.)

- Balance sheet items or accounts are ‘permanent accounts’ that continue to accumulate from one accounting cycle to the next.
- Balance sheet items are recorded on historical cost basis, i.e., the balance sheet neglects any increase in value of assets resulting from inflation and reports assets and liabilities at their book value. It is a big limitation for financial analysts, since a useful analysis could only be made by considering the assets and liabilities at their market value rather than book value. Nevertheless, there are some approaches by which we can solve this problem. Constant rupee approach is one such remedy.
- Constant Rupee Approach: In constant rupee approach, two balance sheets of the same company for different times are compared at a specific time and inflationary adjustments are made.

- **Assets (Left Hand Side):**

Having revised certain concepts and limitations of financial accounting process and financial statements, we would now have a brief overview of the items that appear on the left-hand side of the balance sheet, known as assets.

- Assets are economic and business resources that are used in generating revenue for the organization: They can be tangible (inventory) or intangible (patent, brand value, license). Some assets are classified as current (cash, accounts receivable) and others are fixed (machinery, land, and building). There are also long-term assets (property, loans given) and contingent assets, the value of which can only be assessed in future (legal claim pending, option).
- $\text{Current Assets} = \text{Cash} + \text{Marketable Securities} + \text{Accounts Receivable} + \text{Pre-Paid Expenses} + \text{Inventory}$
- The accounts receivable aging schedule is a listing of the customers making up total accounts receivable balance. Most businesses prepare an accounts receivable aging schedule at the end of each month. Analyzing your accounts receivable aging schedule may help you identify potential cash flow problems.
- Inventory value (at any instant in time) is a very controversial figure which depends on inventory valuation methodology (i.e. FIFO, LIFO, Average Cost) and Depreciation Method (i.e. Straight Line, Double Declining, Accelerated). Companies have the flexibility that they can use one methodology for preparing the financial statements & the different methodology for tax purposes.

- **Liabilities (Right Hand Side):**

The right hand side of the balance sheet represents liabilities.

- Liabilities are sources which are used to acquire the resources or liabilities are obligations of two types:
 - 1) Obligations to outside creditors and
 - 2) Obligations to shareholders known as Equity.
- Liabilities can be short term debts, long term debt, equity, retained earnings, contingent, unrealized gain on holding of marketable securities
- $\text{Current Liabilities} = \text{Accounts Payables} + \text{Short Term Loans} + \text{Accrued Expenses}$
- $\text{Net Working Capital} = \text{Current Assets} - \text{Current Liabilities}$
- $\text{Total Equity} = \text{Common Equity} + \text{Paid In Capital} + \text{Retained Earnings}$ (Retained Earnings is NOT cash always)
- Total Equity represents the residual excess value of Assets over Liabilities: $\text{Assets} - \text{Liabilities} = \text{Equity} = \text{Net Worth}$
- Only cash account represents real cash which can be used to pay your bills!!

Profit & Loss account or Income Statement:

- An income statement is a “flow statement” over a period of time matching the operating cycle of the business, which reports the income of the firm.
- Generally, $\text{Revenue} - \text{Expense} = \text{Income}$

- Right hand side receipts (revenues) are added. Left hand side payments (expenses) are subtracted.
- P/L Items or Accounts are ‘temporary’ accounts that need to be closed at the end of the accounting cycle.
- Sales revenue – Cost of Goods Sold = Gross Profit (Revenue)
- Cost of Goods Sold is a very controversial figure that varies depending on Inventory Valuation Method (i.e., FIFO, LIFO, Average Cost) and Depreciation Method (Straight Line, Double Declining, Accelerated). Depreciation is treated as an expense (although it is non-cash)
- Gross Revenue – Admin & Operating Expenses = Operating Revenue
- Operating Revenue – Other Expenses + Other Revenue = EBIT
- EBIT – Financial Charges & Interest = EBT Note: Leasing Treatment
- EBT – Tax = Net Income
- Net Income – Dividends = Retained Earnings
- Net Income is NOT cash (it can’t pay for bills)

P/L Statement of Company XYZ
Year Ending June 30th 2002)

	(‘000 Rs.)	(‘000 Rs)	(‘000 Rs)
Net Sales	1000		
Cost of Goods Sold	(500)		
Gross Profit	500		
Administration Expenses	(200)		
Depreciation Expense	(0)		
Operating Profit		300	
Other Expenses	(180)		
Other Income (interest)	(0)	(180)	
EBIT		120	
Tax		(20)	
Net Income			100

Cash Flow Statement:

A cash flow statement shows the cash position of the firm and the way cash has been acquired or utilized in an accounting period.

A cash flow statement separates the activities of the firm into three categories, which are operating activities, investing activities and financing activities.

- Operating Cash Flow Statement can be obtained by using two approaches:

- 1) Direct
- 2) Indirect.

A cash flow statement can be derived from P/L or Income Statement and two consecutive year Balance Sheets.

- A cash flow statement is not prepared on accrual basis but rather on cash basis: Actual cash receipts and cash payments.
- The net income is obtained from the Income Statement of a period of time matching the operating cycle of the business. Generally:

$$\text{Revenue} - \text{Expense} = \text{Income}$$

In order to arrive as the cash flows resulting from operating activities Increases in current assets are cash payments (-), i.e., cash outflow

Increases in current liabilities are cash receipts (+), i.e., cash inflow

Right Hand Side Receipts are added.

Left Hand Side payments are subtracted

Statement of Retained Earnings or Shareholders' Equity Statement

Total Equity = Common Par Stock Issued + Paid In Capital + Retained Earnings

(Retained Earnings is the cumulative income that is not given out as Dividend – it is NOT cash)

XYZ

Cash Flow Statement

(June 30th 2001 – June 30th 2002)

	(‘000 Rs)	(‘000 Rs)	(‘000 Rs)
Net Income	400		
Add Depreciation Expense	100		
Subtract Increase in Current Assets:			
Increase in Accounts Receivables	(400)		
Increase in Inventory	(700)		
	(1100)		
Add Increase in Current Liabilities:			
Increase in A/c Payable	500		
Cash Flow from Operations			(100)
Cash Flow from Investments			0
Cash Flow from Financing			500
Net Cash Flow from All Activities			400
Note 1:	Indirect Cash Flow Approach using Income Statement and two consecutive Balance Sheets		
Note 2:	Final Net Cash Flow from All Activities should match the difference in the difference in the closing balances in the Balance Sheets from June 30th 2001 and June 30th 2002		
Note 3:	Investments include all cash sale and purchases of non-current assets and marketable securities		
Note 4:	Financing includes all cash changes in loans, leasing, and equity etc.		

SOME FINANCIAL RATIOS:

LIQUIDITY & SOLVENCY RATIOS:

Current Ratio: Current ratio is a ratio between current assets and liabilities, which tells that for every dollar in current liabilities, how many current assets do the company possess. Since the current liabilities are usually paid out of current assets, it makes sense to compare the two figures to assess the liquidity of the firm. Liquidity implies the ease with which the current liabilities can be paid off. Generally, the higher the ratio, the better it is considered, but too high a ratio may imply less productive use of current assets. A ratio of two to one (2:1) is considered ideal.

$$= \text{Current Assets} / \text{Current Liabilities}$$

Quick/Acid Test ratio: Quick ratio is relatively a stringent measure of liquidity. The ratio is obtained by subtracting inventory from current assets and dividing the result by current liabilities. Inventory is the least liquid of all current assets. By subtracting inventory from current assets, we are actually comparing more liquid assets with current liabilities. This ratio not only helps in gauging the solvency of the company, it may also show if the inventories are piling up. A desirable quick ratio can range from (0.8:1) to (1.5:1) depending on the nature of the business.

$$= (\text{Current Assets} - \text{Inventory}) / \text{Current Liabilities}$$

Average Collection Period: Also known as Days Sales Outstanding, average collection period shows in how many days the Accounts receivables of the company are converted into cash. Most of the companies sell most of their products/services on credit basis, hence it is critical for the company to know in how much time these receivables could be converted to cash in order to ensure liquidity at all times. Average collection period is calculated using the following formula

$$= \text{Average Accounts Receivable} / (\text{Annual Sales} / 360)$$

Note: Average collection period is usually expressed in terms of days. If you find a decimalized answer, you should round it off to the next integer.

PROFITABILITY RATIOS:

The profitability ratios show the combine effects of liquidity, asset management, and debt management on operating result.

Profit Margin (on sales): One of the most commonly used ratios is profit margin on sales. This ratio tells the percentage of profit for every dollar of revenue earned. This ratio is usually expressed in terms of percentage and the general rule is, the higher the ratio, the better it is. Most of the companies compare this ratio to the previous years' ratios to assess if the company is better off.

$$= [\text{Net Income} / \text{Sales}] \times 100$$

Return on Assets: Return on assets is another profitability ratio, which shows the profitability of the company against each dollar invested in total assets. We can obtain this figure by simply by dividing the net profit with total assets. Since the assets are economic resources that are used to earn profit, it is logical to assess if the assets have been used efficiently enough to generate profits. This ratio is also expressed in percentage terms.

$$= [\text{Net Income} / \text{Total Assets}] \times 100$$

Return on equity: Return on equity is of special interest to the shareholders, since equity represents the owners' share in the business. Return on equity can be obtained by dividing the net income with the total equity. This ratio shows that for each dollar in equity how much profit is generated by the company.

$$= [\text{Net Income} / \text{Common Equity}]$$

ASSET MANAGEMENT RATIOS

These measures show how effectively the firm has been managing its assets.

Inventory Turnover:

Inventory turnover shows the number of times the inventories are replenished within one accounting cycle. The ratio can be obtained by dividing the sales by inventory. While the quick ratio measures the liquidity and points out the inventory piling problem, the inventory turnover confirms whether or not the major portion of the current assets of the firm are tied up in inventory. This ratio is also used in measuring the operating cycle and cash cycle of the firm. A higher turnover is desirable as it reflects the liquidity of the inventories.

$$= \text{Sales} / \text{inventories}$$

Total Assets Turnover: An effective use of total assets held by a company ensures greater revenue to the firm. In order to measure how effectively a company has used its total assets to generate revenues, we compute the total assets turnover ratios, dividing the sales by total assets.

$$= \text{Sales} / \text{Total Assets}$$

An increasing ratio over the years may show that with an addition of assets, the company has been able to generate incremental sales in greater proportion.

DEBT (OR CAPITAL STRUCTURE) RATIOS:

Debt-Assets: A commonly used ratio to measure the capital structure of the firm is debt to assets ratio.

Capital structure refers to the financing mix (proportion of debt and equity) of a firm. The greater the proportion of debt in the financing mix, the less willing creditors, and investors would be to provide more finances to the company. In Pakistan, the debt to assets ratio is prescribed in prudential regulations by the State Bank of Pakistan as a guideline for the banks (creditors). A ratio greater than 0.66 to 1 is considered alarming for the providers of funds.

$$= \text{Total Debt} / \text{Total Assets}$$

Debt-Equity: Another commonly used ratio, debt to equity, explicitly shows the proportion to debt to equity. A ratio of 60 to 40 is used for new projects, i.e., for a project it is permitted to raise its finances 60 percent from the debt and 40 percent from equity. Debt to equity is computed by the following formula.

= Total Debt / Total Equity

Times-Interest-Earned: Times-interest-earned reflects the ability of a company to pay its financial charges (interest). This ratio is obtained by dividing the operating profit by the interest charges. Conceptually, the interest charges are to be paid from the earnings before interest and taxes. A ratio of 4 to 1 shows that the company covers the interest charges 4 times, which is generally considered satisfactory by the management, however, a ratio higher than that, may be more desirable. A high time-interest-earned ratio is a good sign, especially for the creditors.

= EBIT / Interest Charges

Market Value Ratios:

Market value ratios relate the firm's stock price to its earnings & book value per share. These ratios give management an indication of what equity investors think of the company's past performance & future prospects

Price Earning Ratio:

It shows how much investors are willing to pay per rupee of reported profits. This ratio reflects the optimism, or lack thereof, investors have about the future performance of the company.

= Market Price per share / *Earnings per share

Market /Book Ratio:

Market to book ratio gives an indication how equity investors regard the company's value. This ratio is also used in case of mergers, acquisition or in the event of bankruptcy of the firm.

= Market Price per share / Book Value per share

***Earning Per Share (EPS):**

= Net Income / Average Number of Common Shares Outstanding

Ratios help us to compare different businesses in the same industry and of a similar size.

Limitations of Financial Statement Analysis:

Despite the fact that ratios are a useful analysis tool, there are certain limitations, which are important for an analyst to understand before applying this tool, in order to make his analysis more meaningful.

- FSA is generally an outdated (because of Historical Cost Basis) post-mortem of what has already happened. It is simply a common starting point for comparison. Use Constant Rupee / Dollar analysis to account for inflation.
- FSA is limited by the fact that financial statements are “window dressed” by creative accountants. Window dressing refers to the understatement or overstatement of financial facts.
- Different companies use different accounting standards for Inventory, Depreciation, etc. therefore comparing their financial ratios can be misleading
- FSA just presents a few static snapshots of a business' financial health but not the complete moving picture.
- It's difficult to say based on Financial Ratios whether a company is healthy or not because that depends on the size and nature of the business.

Difference in Focus:

Financial Statements are prepared by financial accountants with a certain perspective, however the financial managers—the end users of these financial statements, have a different focus to draw meaningful conclusions out of these statements. These differences are listed below

- **Financial Accounting (FA) Focus:**
 - Use Historical Value (assets are booked at original purchase price)
 - Follow Accrual Principle (calculate Net Income based on accrued expense and accrued revenue)
 - How to most logically, clearly, and completely represent the financial data.
- **Financial Management (FM) Focus:**
 - Use Market Value (assets are valued at current market price)
 - Follow Incremental Cash Flows because an Asset's (and a Company's) Value is determined by the cash flows that it generates.
 - How to pick the best assets and liabilities portfolios in order to maximize shareholder wealth.

FM Measures of Financial Health:

The financial management measures that are used for assessing the financial health of a company primarily focus on the basic objective of financial management, i.e., to increase the wealth of the shareholders. Given below are the two important measures of financial health.

M.V.A (Market Value Added):

Market Value Added is a measure of wealth added to the amount of equity capital provided by the shareholders. It can be determined by the following equation

$$\text{MVA (Rupees)} = \text{Market Value of Equity} - \text{Book Value of Equity Capital}$$

Following are the characteristics of MVA

- It is a cumulative measure, i.e., it is measured from the inception of the company to date. Market Value is based on market price of shares.
 - It shows how much more (or less) value the management has succeeded in adding (or reducing) to the company in the eyes of the general public / market.
 - It is used for incentive compensation packages for CEO's and higher level management.
- **E.V.A (Economic Value Added):**

Economic Value Added, on the other hand, focuses on the managerial effectiveness in a given year. It can be obtained by subtracting the cost of total capital from the operating profits of a company

$$\text{EVA (Rupees)} = \text{EBIT (or Operating Profit)} - \text{Cost of Total Capital}$$

EVA has the following characteristics

- It is measured for any one year.
- It is relatively difficult to calculate because Operating Profit depends on Depreciation Method, Inventory Valuation, and Leasing Treatment, etc. Also, a combined Cost of Total Capital (Debt and Equity) is difficult to compute.

TIME VALUE OF MONEY**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following concepts.

- **Main Concepts of FM.**
- **Time Value of Money**
- **Interest Theory and its determinants**
- **Yield curve theory and its dynamics**

FM Concepts:

There are certain financial management concepts that should be kept in mind, while making an analysis of a financial decision. The one-liners given here would help you in committing these concepts to your memory.

- A rupee today is worth more than a rupee tomorrow.
Time Value of Money & Interest
- A safe rupee is worth more than a risky rupee.
 - Risk and Return
- Don't compare apples to oranges
 - Discounting & NPV
- Don't put all your eggs in one basket.
 - Portfolio Diversification
- Get insurance because you will break some eggs.
 - Hedging & Risk Management

Time Value of Money:

The first concept, time value of money, says that a rupee in your hand today is worth more than the rupee that you are going to get tomorrow or the day after. This is because if you have a rupee in hand, you can put it into a bank (invest it) and can earn interest (return) on it, and tomorrow you are going to have more than rupee one, which of course, is more desirable than having just one rupee.

Risk and Return:

Investors want to earn maximum return on their investment; however, risk is a constraint to this objective. Investors dislike risk-bearing, unless they are adequately compensated for that. Now the risk and return concept states that a safe rupee in your hand is better than a risky rupee which is not in your hand. This may imply that the investors would be willing to bear risk if they are offered more than a rupee i.e., a certain premium for risk bearing. However, in the absence of this additional compensation, a safe rupee is better than a risky rupee. The details about the concepts of risk and return would be discussed in the middle of the course.

Discounting & Net Present Value (NPV):

The third concept is of discounting and net present value of money. This is a fundamental mathematical concept and students need to practice it to perfection. Whether discounting for an asset or a company, we have to see what cash flow would it generate during its future life and then we bring back those future cash flow to the present, i.e., we discount the future cash flows to obtain their present value. This exercise is done to make comparison of cash flows occurring in different time periods, i.e., comparing apples to apples, rather than oranges. This concept is relentlessly used throughout the course in comparing different investment options in different time periods.

Portfolio Diversification:

The fourth concept is of portfolio diversification i.e. how to select different investment options so as to reduce risk of losing the invested money. For instance if an investor has a million rupees and he invests his total wealth in a single company's share, he would be exposed to greater risk. If the company goes out of business or faces serious loss, the investor is likely to lose all his investment. However, if that investor puts his total wealth into shares of ten different companies, the chances that all the ten companies would face loss is comparatively lesser and hence the risk for the investor is diversified and reduced. The rule of finance says do not put all your eggs in one basket, because if you drop the basket accidentally, you are likely to lose all the eggs.

Hedging & Risk Management:

Finally, there is this fifth concept of hedging and risk management. Hedging is a strategy of risk management that is employed by investors to reduce or minimize the chances of loss. Insurance is said to be an effective tool used to manage risk. The concept of hedging and risk management says that whether you put your eggs in one basket or in different baskets, chances are there that you will break your eggs so it is better to get the eggs insured. Insurance is the best way to avoid loss so that even if the loss occurs you may get a claim on your damages.

Now, let's discuss the concept of interest in detail, first major & technical area in financial management. Remember, that the basic objective in financial management is to maximize shareholders wealth.

Interest Theory:

- **Economic Theory:**

Interest rate is an equilibrium price, expressed in percentage terms, at which demand and supply of funds (or capital) meet, i.e., the rate at which the lenders are ready to lend and buyers are ready to buy. But equilibrium price (Interest rate) varies from one market to another. For example, the "price" of capital in the property market is different from the "price" of capital in the cotton market. Markets have different interest rates guided by the supply & demand of funds in that market. Although the interest rates in different markets may differ, however, all the markets in the country and the interest rates prevailing there are interlinked.

Now, we come to the factors that determine the interest rates. It is important to understand the factors that make up an interest rate in the present day business environment. In business when we talk about the interest, we usually refer to nominal rate of interest which is determined with the help of following factors.

Factors

$$i = iRF + g + DR + MR + LP + SR$$

– i is the nominal interest rate generally quoted in papers. The "real" interest rate = $i - g$

Here i = market interest rate

g = rate of inflation

DR = Default risk premium

MR = Maturity risk premium

LP = Liquidity preference

SR = Sovereign Risk

The explanation of these determinants of interest rates is given as under:

Risk Free Interest Rate (RF):

Factually speaking, there is no such thing as a risk-free rate of return because no investment can be entirely risk-free. All the investments and securities include a certain amount of risk. A company may go bankrupt or close down. However, if we talk about the relevant risk involved in different securities, the government-issued securities are considered as risk-free, since the chances of default of a government are minimal. These government issued securities provide a benchmark for the determination of interest rates. Internationally the US T-Bills are considered as risk free rate of return. In Pakistan, Government of Pakistan T-Bills can be used as a proxy for risk free rate of return, however, since Pakistan faces some sovereign risk, the T-bills would not be considered entirely risk-free in the true sense.

Inflation (g):

The expected average inflation over the life of the investment or security is usually inculcated in the nominal interest rate by the issuer of security to cover the inflation risk. For instance, consider a bond with a maturity of 5 years. If the inflation rate in Pakistan is 8 % and the bond is also offering 8% percent interest rate, the investors would not be willing to invest in the bond since the gains from the interest rate would be exactly offset by the inflation rate which is actually eroding the wealth of the investor. To secure the investor against inflation the issuers, while quoting nominal interest rates, add the rate of inflation to the real interest rate.

Default Risk Premium (DR):

Default risk refers to the risk that the company might go bankrupt or close down & bonds, or shares issued by the company may collapse. Default Risk Premium is charged by the investor, as compensation, against the risk that the company might go bankrupt. Companies may also default on

interest payments, something not very unusual in the corporate world. In USA, rating agencies like Moody's and S&P grade securities (debt and equity instruments) according to their financial health and thus identify those companies which have a good ability to pay off their principal lending and interest charges and those which might default on the payments. The rating from best to worst is: AAA, AA, A, BBB, BB, B, CCC, CC, C. In Pakistan, Pakistan Credit Rating Agency (PACRA) and Vital Information Services (VIS) are actively conducting analysis of corporate securities and grading them.

Maturity Risk Premium (MR):

The maturity risk premium is linked to the life of that security. For example, if you purchase the long term Federal Investment Bonds issued by the government of Pakistan, you are assuming certain risk, because changes in the rates of inflation or interest rates would depreciate the value of your investment. These changes are more likely in the long term and less likely in the short term. Maturity Risk Premium is linked to life of the investment. The longer the maturity period, the higher the maturity risk premium.

Sovereign Risk Premium (SR):

Sovereign Risk refers to the risk of government default on debt because of political or economic turmoil, war, prolonged budget and trade deficits. This risk is also linked to foreign exchange (F/x), depreciation, and devaluation. Now-a-days the individuals as well as institutions are investing billions of rupees globally. If a bank wants to invest in Pakistan, it will have to take view of Pakistan's political, economic, and financial environment. If the bank sees some risk involved it would be willing to lend at a higher interest rate. The interest rate would be high since the bank would add sovereign risk premium to the interest rate. Here it may be clarified that Pakistan is not considered as risky as many other countries of Africa and South America.

Liquidity Preference (LP):

Investor psychology is such that they prefer easily encashable securities. Moreover, they charge the borrower for forgoing their liquidity. A higher liquidity preference would always push the interest rates upwards.

Yield Curve Theory:

Term Structure and Yield Curve:

Interest rates for any security vary across time horizon. The supply & demand for funds vary depending on how long the funds are required. Normally, short term interest rates are lower than long term rates, or we can say that the interest rates depend on their term structure. Based on the maturity, the securities can be classified into three categories, although, these classes have been loosely defined.

Short Term: Short term means for the period of one year or less.

Medium Term: For the period of any where between one year to five years.

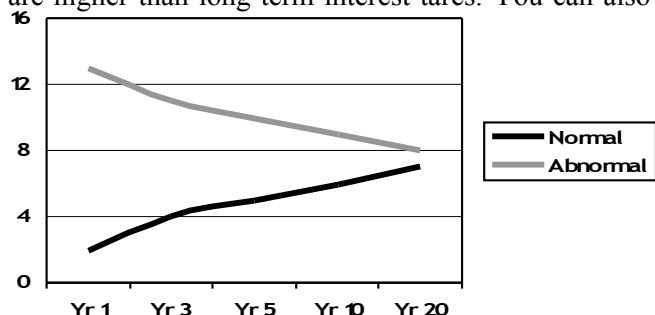
Long Term: Any where between 15 years to 20 years some people say that medium term is from 5 year to ten years and long term from 10 years to 20 years and plus.

Nominal or upward sloping yield curve:

The supply & demand of funds or capital varies depending upon how long funds are required. For example, today the supply and demand for short term money might be different from supply and demand of the long term money. In another words, the number of borrowers to take loan for one week may be different from the borrowers of loan for one year. Short term interest may be different than the long term interest; normally, short term interest rates are lower than long term than interest rates because investors think that inflation is going to increase. This phenomenon results in **nominal or upward sloping yield curve.**

Abnormal or downward sloping yield curve:

Sometimes, the reverse is true. This is known as the Abnormal (or Downward Sloping) Yield Curve. It is the case where the short term rates are higher than long term interest rates. You can also have a mixed or Humped Back Curve.



Now, we go into the reason why the curves have either upward slope or downward slope. Following are some of the factors that determine the slope of the yield curves.

Expectations Theory:

Investors normally expect inflation (and interest) to rise with time thereby giving rise to a normal shaped yield curve.

Liquidity Preference Theory:

Investors prefer easily encashable securities with short maturities. The only problem is that short term securities are easy to encash but at maturity there is no guarantee that you can renew it .so, you can find a security today which will give you 25 %or 30% per annum they are not always renewable – hence unpredictable.

Market Segmentation:

The demand/supply for Short Term securities is different from that of Long Term securities. This can easily give rise to an Abnormal Yield Curve.

Now let's talk about the practical types of interest there three kinds of interest we will talk about

1-simple interest

2-discrete compound interest

3-continuous compound interest

1. Simple Interest (or Straight Line):

Simple interest incurs only on the principal. While calculating simple interest we keep the interest and principal separately, i.e., the interest incurred in one year is not added to the principal while calculating interest of the next period. Simple interest can be calculated using the following formula.

$$FV = PV + (PV \times i \times n)$$

Example: Assume that you have Rs 100 today and you want to invest the amount with a bank for five years. The bank is offering an interest rate of 7 percent. We can obtain the simple interest on the investment using the aforementioned formula

$$FV = PV + (PV \times i \times n)$$

Here FV is the simple interest accrued for the term of the investment

PV is the amount invested, i.e., Rs 100 in our example

i stands for the interest rate offered by the bank, i.e., 7 % = 0.07

n is the term of the investment, which is assumed to be 5 years

Putting these values in the formula, we get

$$FV = 100 + (100 \times 0.07 \times 5)$$

$$FV = 100 + (7 \times 5)$$

$$FV = 100 + (35)$$

$$FV = \text{Rs } 135$$

Here Rs 135 is the future value of investment after five years and Rs 35 is the interest accrued during five years on the initial investment of Rs 100.

2. Discrete Compound Interest:

Discrete compound interest is the most commonly used tool in Financial Management Discounting and NPV calculations. Unlike simple interest, compound interest takes into account the principal as well as interest accrued for a term, while calculating interest incurred during the next term., i.e., interest incurred for one year would be added to the principal to calculate the interest for the next period. However, this compounding of interest takes place in a discrete manner, i.e., the compounding takes place yearly, semi-annually, quarterly, or monthly. For computing the annual compounding, we use the following formula

Annual (yearly) compounding:

$$FV = PV \times (1 + i)^n$$

However, a slight modification in the formula is need if the compounding takes place monthly. Such a compounding would be calculated using the following formula.

$$FV = PV \times (1 + (i / m))^{m \times n}$$

Here 'm' refers to the compounding intervals during the term of the investment. In order to calculate monthly compounding, the value of 'm' would be 12; however, for quarterly compounding calculation m would be equal to 4

Example:

Assume that the investor in our previous example is offered a compound return (interest) on his same investment, at the same interest rate and term. The future value of the investment is given as under

$$\begin{aligned}FV &= PV \times (1 + i)^n \\FV &= 100 \times (1 + 0.07)^5 \\FV &= 100 \times (1.07)^5 \\FV &= 100 \times (1.40255) \\FV &= 140.255\end{aligned}$$

Here the interest accrued on the five year investment is more than what we found out in simple interest. However if the compounding is done every month the future value of investment would be

$$\begin{aligned}FV &= PV \times (1 + (i / m))^{m \times n} \\FV &= 100 \times (1 + (0.07/12))^{12 \times 5} \\FV &= 100 \times (1 + 0.005833)^{60} \\FV &= 100 \times (1.005833)^{60} \\FV &= 100 \times 1.4176 \\FV &= 141.76\end{aligned}$$

With more frequent compounding, the wealth of the investor increases to a greater degree.

3. Continuous (or Exponential) Compound Interest:

The other type of compound interest is exponential compound interest. In this compound interest an infinite number of times per year at intervals of microseconds.

$$FV \text{ (Continuous compounding)} = PV \times e^{i \times n}$$

Here e is a constant the derived value of which is 2.718

Example:

Assume that the same investor has now the opportunity of investing at continuous compounding with the same term and interest rate. His future wealth after five years is given as under

$$\begin{aligned}FV &= PV \times e^{i \times n} \\FV &= 100 \times 2.718^{(0.07 \times 5)} \\FV &= 100 \times 1.419 \\FV &= 141.9\end{aligned}$$

We can see that the wealth of the investor is the highest, when he decided to invest in a scheme which offers continuous compounding.

The difference between simple and compound interest can increase manifold if the term of the investment is increased. As we see in the following example

Example:

Suppose you deposit Rs 10 in a bank today. The bank offers you 10% per annum (or per year) interest. How much money will you have in the bank after 15 years?

If the bank is offering simple interest:

$$FV = PV + (PV \times i \times n) = 10 + (10 \times 0.10 \times 15) = \text{Rs. } 25$$

If the bank is offering discrete compounding:

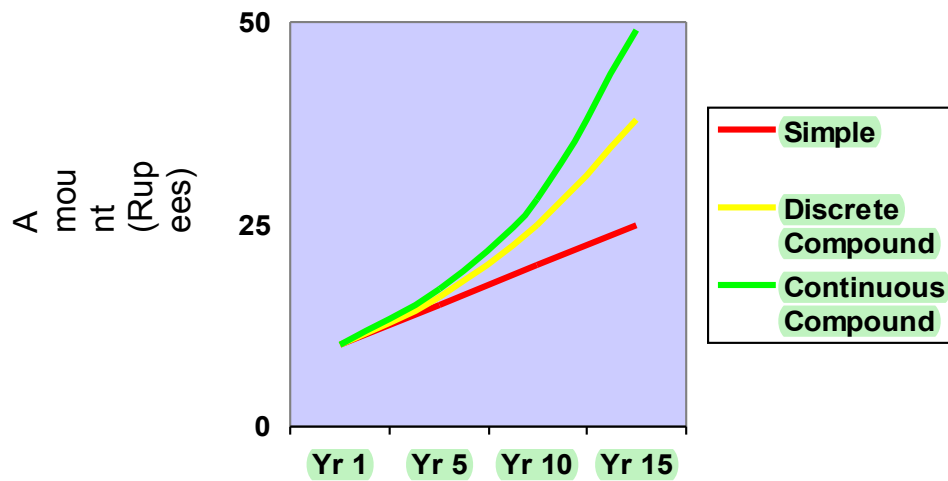
$$FV = PV \times (1 + i)^n = 10 \times (1 + 0.10)^{15} = \text{Rs. } 42 \text{ approx.}$$

Banks do not offer continuous compounding but if they did:

$$FV = PV \times e^{i \times n} = 10 \times (2.718)^{0.10 \times 15} = \text{Rs. } 45 \text{ approx}$$

Graphical View of Compounding

The miracle of compounding – you earn interest on interest & principal!



Note: After 15 years, Continuous Compounding gives you almost two times more money than Simple Interest. Compound Interest gives you about one-and-a-half times as much!

FINANCIAL FORECASTING AND FINANCIAL PLANNING**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following concepts.

- **Financial Forecasting and Financial Planning.**
- **Methods of forecasting**

Before going into the detailed calculation of cash flow, it is important to know the principles behind financial forecasting and financial planning.

Although, financial planning and forecasting cannot reduce the uncertainty in our lives, the idea is simply to acknowledge and identify different points in time, where we expect some future occurrences, and to prepare plans and contingencies in the light of those forecasted happenings. Of course, we cannot be certain about the future, but we can always plan and arrange for it.

Objectives of Financial Forecasting:

Although, financial planning and forecasting cannot reduce the uncertainty in our lives, the idea is simply to acknowledge and identify different points in time, where we expect some future occurrences, and to prepare plans and contingencies in the light of those forecasted happenings. Of course, we cannot be certain about the future, but we can always plan and arrange for it.

- 1) Reduce cost of responding to emergencies by anticipating the future occurrences
- 2) Prepare to take advantage of future opportunities
- 3) Prepare contingency and emergency plans
- 4) Prepare to deal with possible outcomes

Planning Documents:

There are three types of documents that are to be prepared while making a financial plan. These are

- 1) Cash Budget
- 2) Pro Forma Balance Sheet
- 3) Pro Forma Income Statement

Here, the term 'pro forma' refers to forecasting. These pro forma statements are prepared on the basis of certain estimates.

Methods of forecasting

In order to prepare pro forma statements, two methods are commonly practiced, which are given as under

- **Percentage of Sales:** Simple
- **Cash Budget:** Detailed, more complicated

Percentage of sales:

Step 1: Estimate year-by-year Sales Revenue and Expenses

Step 2: Estimate Levels of Investment Needs (in Assets) required meeting estimated sales (using Financial Ratios). That how the Assets of the company changes with the change in

Step 3: Estimate the Financing Needs (Liabilities)

Explanation:

While employing percentage of sales method, we would estimate the cash flows based on the sales revenue. The first step is to forecast the changes in the sales revenue in the successive years. Expenses incurring in successive period would also be estimated. These expenses include cost of goods sold expense, administrative, expense, marketing expense, depreciation expense, and other expenses. However, these revenues and expenses would be estimated on cash, rather than accrual basis.

After estimating the revenues and expenses, we need to forecast the anticipated changes in assets and liabilities as a result of changes in sales. Having forecasted the assets and liabilities as a result of changes in sale, we would be able to identify how much capital the firm has to invest in assets and how much the company needs to borrow as a result of any shortfall. Here, we would examine the various heads of assets and liabilities and their relationship with sales. We can establish these relations by identifying the changes in assets and liabilities as a result of change in sales, and to do that certain assumptions need to be considered.

GENERAL ASSUMPTIONS

Current Assets: Generally grow in proportion to Sales.

Fixed Assets: Do not always grow in proportion to Sales. Ask if you need to expand property, office or factory space, machinery in order to achieve your Sales target.

Current Liabilities: Also called Spontaneous Financing. Generally grow in proportion to Sale
 Long Term Liabilities: Also, called Discretionary Financing does not grow in proportion to Sales

Explanation:

Current assets include cash, marketable securities, accounts receivable, inventory, and prepaid expenses. Out of these current assets, changes in cash, accounts receivable and inventory can be directly linked to changes in sales. However, marketable securities and prepaid expenses are independent of sales, i.e., changes in sales may not affect these two heads. It is also important to note that the current assets do not change exactly in the same proportion as the sales in real life situation, i.e., an increase of 10 percent in sales may not necessarily guarantee that the current assets would also increase by 10 percent. However, for the sake of simplicity we would assume that the current assets change proportionally as the sales change.

On the other hand, fixed assets do not change directly with a change in sales. For example, if you plan to increase the sales revenue by 20% then it is not necessary to increase the fixed assets by 20%. But, if a company plans to double its sales in the next three years, the company might have to increase its fixed assets; however, small year-to-year changes in sales do not affect the fixed assets.

Current liabilities include accounts payable, short term portion of long term liabilities and accrued expenses. Current liabilities like current assets are assumed to grow proportionally with any growth in sales. If the sales of a company increase by 30 percent, its current liabilities would also increase by 30 percent. Current liabilities are also called spontaneous financing since they move in direct relation with changes in sales.

However, the long term liabilities, also known as discretionary financing, do not directly change in proportion to the changes in sales revenue.

In order to have a better understanding of the aforementioned concepts, let us take into consideration a numerical example.

Example:

Assume that you are establishing cafeteria as a new business venture. In order to get your project funded you would be needing capital. In addition, you would also need to forecast how your business would generate revenues and incur expenses in the coming years.

Suppose you expect the Sales Revenue from your Café (or Canteen) business to grow from Rs 200,000 to Rs 300,000 and your Expenses to grow from Rs 50,000 to Rs 70,000 after 1 year. These forecasts can be based on the business environment in which the business operates, competition faced by the business, marketing efforts and activities of the business and the target market.

The first thing we need to calculate here is the sales growth rate. The increase in the sales in Rupee terms is $300,000 - 200,000 = \text{Rs.} 100,000$. The sales revenue has increased up to rupees 100,000 rate of increase is 50% as present sales were Rs.200,000.

This means that the Sales Revenue growth rate is:

$$(300,000 - 200,000) / 200,000 = 0.5 = 50\%$$

Similarly an increase in expenses of Rs 20,000 shows that the rate of increase in expense is 40% (i.e., increase of Rs 20,000 in expenses divided by the expenses in year one).

After forecasting the growth rate in revenues and expenses, the next step is to estimate the changes in investment and financing (i.e., changes in assets and liabilities).

In order to estimate these changes, we would need to calculate a few ratios.

In order to estimate the current assets for the next year, we need to calculate the ratio current asset to sales for the current year. In order to arrive at the estimate of current assets for the next year we would simply multiply the estimated sales for the next year with the ratio.

Estimated current assets for the next year

$$= [\text{Current assets for the current year} / \text{Current sales}] \times \text{Estimated sales for the next year}$$

If we assume the current assets/sales ratio to be 20 percent, putting in the values in the aforementioned equation, we get

$$\text{Current assets for the next year} = 300,000 \times (0.2) = 60,000$$

This shows that with an increase in sales of Rs 100,000, the current assets of the cafeteria are likely to increase as 20 percent of the sales.

We will assume here that there is no change in the fixed assets. As mentioned earlier, fixed assets do not change with year-to-year changes in sales, however, over a period of time, the fixed assets may be increased as the business requires expansion.

The next step is to forecast the retained earnings—the amount of profit which would be reinvested in the business. Retained earning forecasting is important so that any shortfall in cash could be identified and the amount of external financing necessary for the business could also be assessed. Retained earnings can be estimated using the following formula

Expected Estimated retained earnings

= estimated sales x profit margin x plowback ratio

Plow back ratio = 1 - pay out ratio

Pay out ratio = dividend/net income

Profit margin = net income/sales

Here, we assume that the profit margin ratio is 25 percent, whereas payout ratio of the cafeteria is 50 percent

Estimated retained earnings = $300,000 \times 0.25 \times (1 - 0.5)$
 $= 75,000 \times (1 - 0.5) = \text{Rs. } 37,500$

Rs 37,500/- is predicted retained earnings amount which should appear in the pro forma balance sheet. It shows that half of the income will be distributed among the owners & the other half will be reinvested.

Now let's forecast the external or discretionary financing (external financing), since we have estimated the revenues and expenses of the business, the changes in assets and the part of the net income that is to be reinvested in the business.

The formula will be used:

Estimated discretionary financing

= estimated total assets – estimated total liabilities – estimated total equity

Estimated total equity can be found out by adding the retained earnings plus initial investment. The business was started with an initial investment of Rs 100,000 and then after one year of operations the earnings retained out of the profit, i.e., Rs 37,500 would be added to the equity. Hence the total equity is Rs 137,500.

Now we can easily solve the above given equation

Estimated discretionary financing

= estimated total assets – estimated total liabilities – estimated total equity
 $= 160,000 - 0 - 137,500 = \text{Rs. } 22,500$

This is the borrowing that we need to raise in form of loan or the equity, as a result of growth in sales.

After calculating the estimated revenues, expenses, assets and liabilities, we are in a position to prepare the pro forma cash flow statement. The owners like to see the company to grow at a steady rate rather than high growth & slump scenario. The shareholders prefer those companies where growth rate is steady and consistent & the managers need to make sure that the growth rate remains steady.

If you want to maintain the forecasted financial ratios that you have calculated and along with this we do not want additional personal capital to be invested in the business, then at what rate the business is growing can be calculated by the following formula

G (Desired Growth Rate) = return on equity x (1 - pay out ratio)

Pay out ratio as defined above equals, dividends/net income.

Return on equity is net income/ total equity.

Return on equity would be discussed in detail when we would study the rate of return & capital budgeting.

Drawback of Percent of Sales Method:

Despite the fact that percentage of sales method is widely used method for forecasting, it has certain disadvantages.

The first and the foremost problem with this method is that it is only a rough approximation and is not very detailed. The other problem is that if there is a change in fixed assets during the forecasted period the percentage of sales method would not yield a very accurate answer. The third problem is that the lumpy assets are not taken into account while using the percentage of sales method. Here, lumpy assets refer to those assets which can only be acquired in large discrete units.

Summarizing the above discussion, we can say that in percentage of sales method of forecasting pro forma cash flow statement most of the heads in the balance sheet are linked to the sales growth of the business. First of all, we need to know the ratios of assets and liabilities to sales for the

current period. These ratios are then applied to the estimated sales for the next period to get a forecast of assets and liabilities for the next period.

After understanding the dynamics of percentage of sales method, and having prepared the pro forma income statement and pro forma balance sheet, we are in a position to discuss the forecasted or pro forma cash flow statement. A pro forma cash flow statement is just like an ordinary cash flow statement; the only difference is that the figures in a pro forma cash flow statement are estimated figures rather than actual ones. The estimated statement is later compared to the real after-effect cash flow statement to assess the quality of the estimate.

After calculating the estimated sales revenue, we have already calculated the estimated net income of the business, multiplying the estimated figure of sales for the next year with the profit margin ratio. Forecasted net income gives the starting point for an estimated cash flow statement. If the assets are 20% of sales and depreciation is 10% of the assets then the depreciation is 10% multiply 20% which is equal to 2% of sales. After calculating depreciation at 2%, you can calculate the forecasted depreciation this will appear in our forecasted cash flow statement. Afterwards we would see the increases and decreases in current assets and current liabilities. An increase in current assets and increase in current liabilities can be calculated using constant percentage of sales approach. We can compare the forecasted cash flow with the actual cash flow statement to know how much accurate our estimates are. If we use indirect cash flow then the first thing is our net income plus depreciation, minus increase in current assets, plus decrease in current liabilities, would provide us with cash flows from operations.

PRO FORMA CASH FLOW STATEMENT

	(‘000 Rs)	(‘000 Rs)	(‘000 Rs)
Net Income		400	
Add Depreciation Expense		100	
Subtract Increase in Current Assets:			
Increase in Cash	(400)		
Increase in Inventory	(700)		
		(1100)	
Add Increase in Current Liabilities:			
Increase in A/c Payable		500	
Cash Flow from Operations			(100)
Cash Flow from Investments			0
Cash Flow from Financing			500
Net Cash Flow from All Activities			400
Note 1:	Indirect Cash Flow Approach using Income Statement and two consecutive Balance Sheets		
Note 2:	Final Net Cash Flow from All Activities should match the difference in the difference in the closing balances in the Balance Sheets from June 30th 2001 and June 30th 2002		
Note 3:	Investments include all cash sale and purchases of non-current assets and marketable securities		
Note 4:	Financing includes all cash changes in loans, leasing, and equity etc.		

PRESENT VALUE AND DISCOUNTING**Learning objectives:**

After studying this lecture, you would be able to have a better understanding of the following.

- Present Value and Discounting

The Topics of this lecture are covered in the chapter 6 of our text book called Financial Management theory and practice by Eugene F. Brigham & Louis C. Gapenski.

Objectives of present value:

The objective of calculating the present value is to translate the future cash flows in to present terms. The basic principle is to compare apples with apples. For instance, if you have Rs.10 in your pocket today and then you have may as many rupees ten years after, how can you compare the two. You can do it only by comparing both amounts at the Present time.

We choose the present (today) as the most convenient point in time where we could compare all the cash flows taking place at various points in time in future. We must compare everything at the SAME point in time otherwise; we would be neglecting the Time Value of money concept.

For example, Rs 105 is more than Rs 100 BUT; Rs105 after 1 year may not necessarily be more than Rs100 today! We first have to first bring all cash flows to the Present, or Discount them, and then compare them. The concept of present value says that we can compare both the amounts in the date of today we will bring back future cash flows to the present

Discounting:

“Discounting is defined as bringing the future cash flow to the present time”.

Before answering which amount is greater in the aforementioned example, we need to have some concept of interest rates or the cost of money. An interest rate can also be understood as an opportunity cost.

One of the simple ways of estimating what opportunity cost or interest rate should be for our discounting calculations, we can use interest rate given on the PLS accounts by the banks. For example, if money is deposited in a bank and getting 10% per annum then it is interest or opportunity cost for you. This interest on PLS account becomes minimum rate of return which any investment should be able to generate. Therefore, the investment project should offer higher rate of return than the returns on the PLS account.

Now let's see the answer of the question that Rs.105 will be more one year later or Rs.100 today, and for this, we need interest or opportunity cost. It is important to understand why interest rate is called opportunity cost? Because, opportunity cost essentially means the cost of taking up one option while sacrificing the other. For instance, when you deposit your money in the bank and get interest, you are sacrificing by

- (1) Not consuming the money to buy something for yourself and
- (2) Not investing your money elsewhere at a higher return than the bank interest.

Usually when an investment option is taken up, investors forgo the option of depositing the money in a bank account and earn interest on that. The opportunity lost in this case is the opportunity cost. Now the question is that what kind of interest rate should we use? There are many interest rates quoted in the schedules of the bank but for discounting, the most commonly used rate is the nominal interest rate, or APR.

Interest Rates for Discounting Calculations

- **Nominal (or APR) Interest Rate = i_{nom}**

- It is usually published in newspapers .Annual Nominal Interest Rate is quoted for 1 year by Credit Card Companies and Leasing Companies because it understates the actual (or Effective) interest you have to pay, these companies want to create an impression that the interest charged by them is the minimum in the market.

- **Periodic Interest Rate = i_{per}**

Periodic interest rate is used in FM for Discounting and Present Value (PV) calculations. It is defined as

$$i_{per} = (i_{nominal} \text{ Interest rate}) / m$$

Where

m = no. of times compounding takes place in 1 year i.e.

If semi-annual compounding then $m = 2$

- Effective Interest Rate = i_{eff}**

It is very useful to compare securities and investments with different life or compounding cycles but not used for Discounting and PV.

$$i_{\text{eff}} = [1 + (i_{\text{nom}} / m)]^m - 1$$

Where m = no. of times compounding takes place in 1 year, the compounding cycle. The shorter the compounding cycle more frequently money compounded & faster the money grows.

Coming back to our earlier example where we were trying to figure out whether or not Rs 100 of today are worth more than Rs 105 a year after, while the periodic interest rate is 10 percent per annum. The interest rate used here would be the nominal interest rate, i.e., 10 percent. When we are going to solve for the present value we are discounting from the future to the present

$$PV = FV / (1+i)^n$$

Where, i = interest rate

N = no. of years if we plug in the values

$$PV = 105 / (1 + 0.10)^1 = \text{Rs. } 95.45$$

Now we can see that if we discount Rs.105 from future to the present that is only the worth of Rs.95.45 which is less than Rs.100. The amount offered in the future is seemingly more but when converted to present value, the worth it has today, it come out to be less than Rs 100. Thus, it is clear that Rs100 today worth more to Rs. 105 one year later. This conclusion is drawn on the assumption that interest rate is 10%, but if we change the interest rate, the answer might be different.

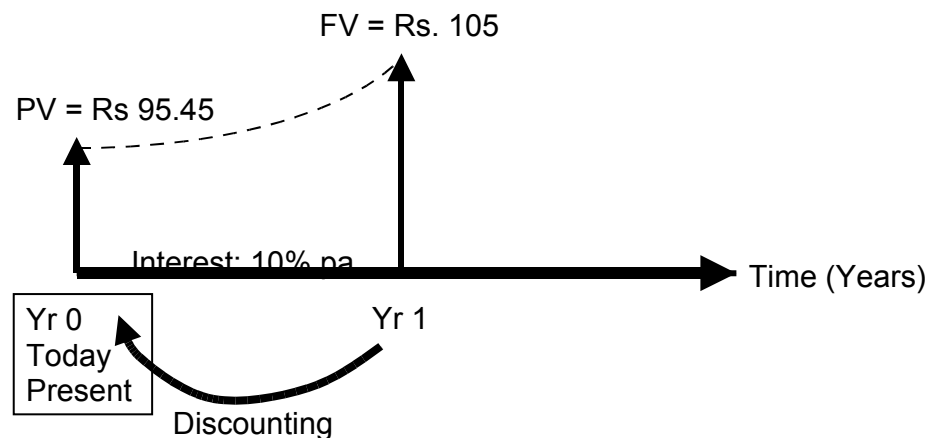
With the help of the following diagram, we can observe the effect of discounting the cash flows. Now the point to understand is that if we discount back this money from 2 years back we would have only approximate Rs.87 in other words if Rs 105 are to be received after two years, the present value of would be even lesser

If you discount Rs 105 two years from now, you will have lesser amount than you have one year from today. It is clear from the slide that as more future cash flow occurs distant in time, the more its present value decreases.

Time & Arrow Diagram

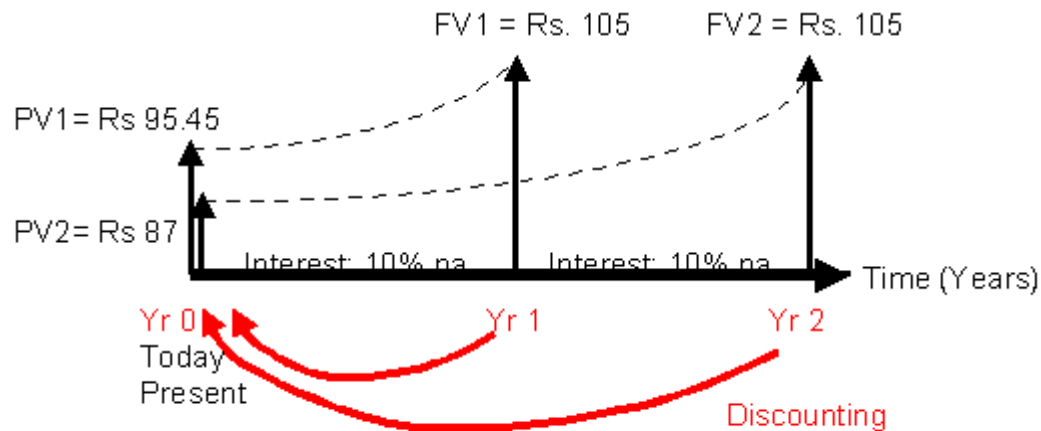
1 Year Discounting of Future Value

Time & Arrow Diagrams are important in visualizing the concept of Discounting



Time & Arrow Diagram 2 Year Discounting of Future Value

Notice how Discounting Rs 105 (FV2) from Year 2 gives a smaller Present Value (PV2 = Rs 87) than Discounting Rs 105 from Year 1



Cash inflows (Income, other income & cash profits) shown with upward pointing arrow
Cash outflows (expense) shown with downward pointing arrow

Discounting Cash Flows of a Business, Investment, or Project:

Let's talk about the discounting cash flow of the business as to how we would estimate the cash flow business can generate? How can we calculate the market value and intrinsic value of a business or working asset? There are two steps involved

- 1) Forecast future cash flows of any business, investment, or project by using percent of sales method.
- 2) Discount the net cash flows back to the present time.

The two-step process here can be elaborated by the following hypothetical example.

Cafe Case Study:

Suppose you are thinking about starting a small café or canteen inside a university campus. You make a simple feasibility report showing the estimated initial investment and the forecasted cash flows for the first Year (based on expected cash receipts from sales and cash payments for expenses).

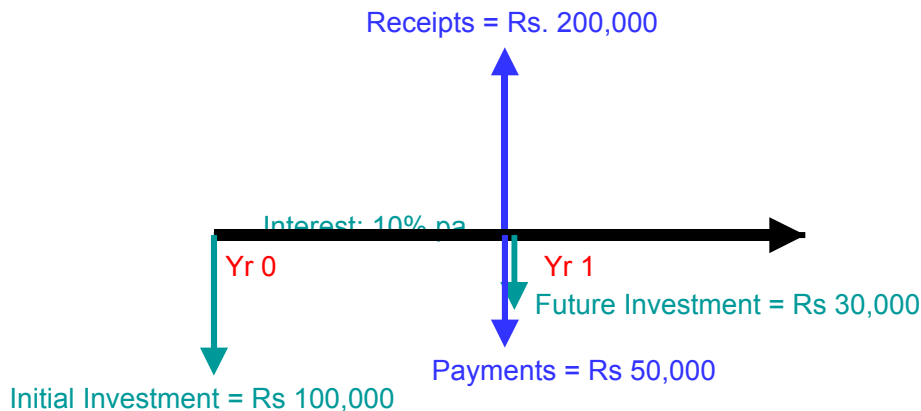
The Key Financial Data is as follows:

- Initial Investment = Rs 100,000
- Forecasted Cash Receipts (end Year 1) = Rs 200,000
- Forecasted Cash Payments (end Year 1) = Rs 50,000
- Forecasted Future Investment (end Year 1) = Rs 30,000
- Periodic Interest Rate (Opportunity Cost) = 10% p.a.

First step is to represent the phenomenon through a diagram in the form of cash out flows.

Cash Flow Diagram Café Example

Use **Downward Pointing Arrows** to show **Cash Outflows** (Cash Payments or Investments). Use **Upward Pointing Arrows** to show **Cash Inflows** (Cash Receipts)

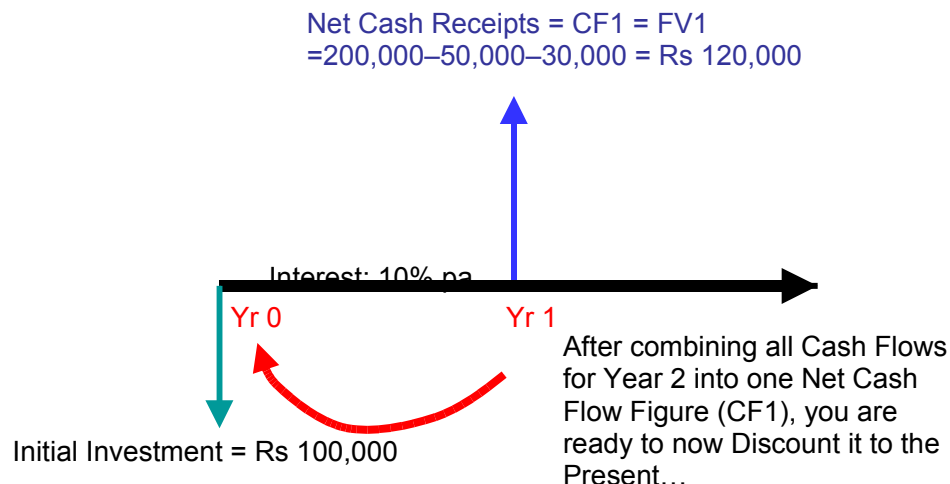


First of all, we can see the initial investment represented by the downward arrow. We have also forecasted the sales one year from now that is Rs.200, 000. This is a cash inflow for the business and is represented by an upward arrow; similarly, the expenses and investments (cash outflows) that we expect in future, will be shown by the downward arrows. In the diagram there are three arrows, the upward one is showing forecasted sales (cash inflow) and two arrows downward show expenses of Rs.50, 000 and invest outlay of Rs.30, 000 respectively. Now the combined effect of the three arrows can be represented by a single arrow. We can see that cash inflow of Rs.200,000 is having a +ve sign and expenses of Rs.50,000 and investment out lay of Rs.30,000 have –ve signs and finally, by deducting the negative signed figures from the positive one we can arrive at the net effect of the cash inflows and outflows, which is given as under

$$200,000 - 50,000 - 30,000 = \text{Rs } 120,000.$$

These different arrows can be added or subtracted because they are occurring at the same point of time and Rs.120, 000 can be shown by one arrow sign. In order to calculate the present value of Rs.120, 000, rate of interest as discount factor should be 10% per year.

Simplified Cash Flow Diagram Café Example



Calculating the NPV of the Café Business for 1st Year:

NPV = Net Present Value (taking Investment outflows into account)

$NPV = -\text{Initial Investment} + \text{Sum of Net Cash Flows from Each Future Year.}$

$NPV = -I_0 + PV(CF1) + PV(CF2) + PV(CF3) + PV(CF4) + \dots + \infty$

Note that PV (CF1) means the Present Value of Future Net Cash Flow (CF) taking place at the end of Year 1. CF is like the FV in our interest formulas. Our compounding cycle is 1 year so the Periodic Interest Rate is 10%. 

Present Value of Net Cash Flow from Year 1 =

$PV(CF1) = CF1 / (1+i)^n = 120,000 / (1+0.1)^1 = \text{Rs } 109,000$

The value of money has shrink from Rs.120, 000 to 109,000 as the concept of time value of the money suggests and now we are in position to calculate the net present value of the money:

$NPV = -I_0 + PV(CF1) = -100,000 + 109,000 = + \text{Rs } 9,000$

The NPV of our Business after 1 Year is Positive Rs 9,000 which is a good sign. We will discuss this topic in more detail in capital budgeting.

DISCOUNTING CASH FLOW ANALYSIS, ANNUITIES AND PERPETUITIES**Learning Objectives:**

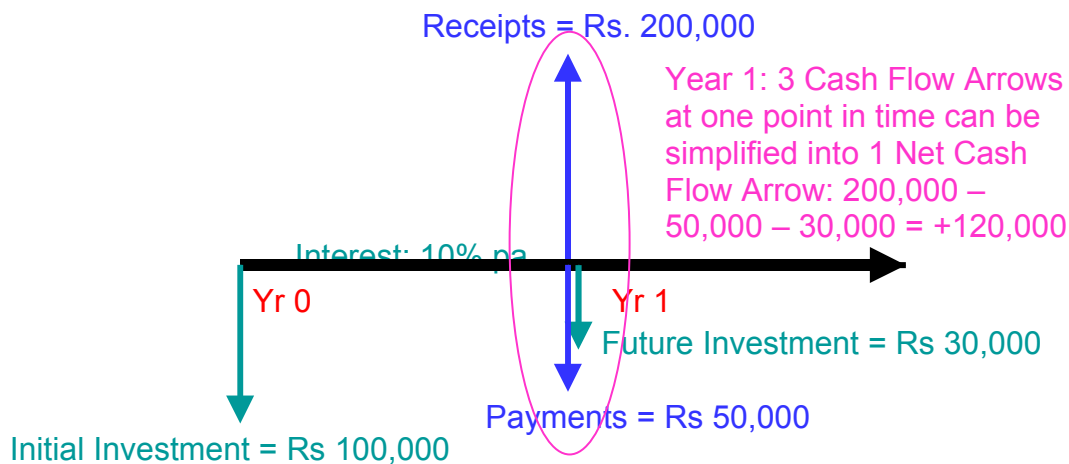
After going through this lecture, you would be able to have an understanding of the following concepts.

- **Discounted Cash Flows (DCF Analysis)**
- **Annuities**
- **Perpetuity**

This lecture is continuation of the previous lecture's topics. In the previous lecture, we had discussed the calculation of the Net Present Value (NPV) and the use of the value of interest rate or Opportunity cost in the process. Bank Interest on the PLS Account represents the Minimum Opportunity Cost of our investment. A good investment opportunity should, however, offer a higher return than the Bank Interest rate. We also used the time & arrow diagram to show the cash flows forecast. In the diagram, we used upward pointing arrow to represent the cash inflows & downward pointing arrow are used to represent the cash outflows. You can simplify that diagram by arithmetically solving the upward & down ward pointing arrows at same point in time by showing it with one arrow. (see Fig)

Cash Flow Diagram Recap of Café Example

Use Downward Pointing Arrows to show Cash Outflows (Cash Payments or Expenses or Investments). Use Upward Pointing Arrows to show Cash Inflows (Cash Receipts ie. Cash Revenue or Income)



The arrows in time-and-arrow diagram can be added and subtracted when they are on same point in time but when these arrows are at the different point of time these cannot be added or subtracted. Now, let's talk about some common cash flow patterns the most common is called annuity.

Annuity:

An **annuity** is a series of fixed payments, which might be over a fixed number of years, or over the lifetime of an individual, or both. The commonly known types of annuities we see are the monthly rent, and monthly mortgage payments, or insurance premiums.

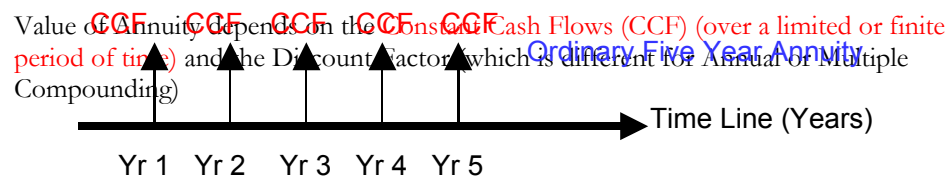
There are two types of annuities

1. Ordinary Annuity

An ordinary annuity, also known as deferred annuity, consists of a series of equal payments at the end of each period.

2. Annuity Due

An annuity due consists of a series of equal payments at the beginning of each period.



Annual Compounding (at end of every year):

$$FV = CCF (1 + i)^n - 1$$

For example, the payment of Rs.10,000 as monthly rental to the land lord is an annuity which gives birth to an annuity stream. Future value of an annuity can be seen as follows:

$$\text{Future value of annuity} = \text{constant cash flows} \times (1+i)^n - 1/i$$

Where, i =interest rate

n =no. of years

We can write this formula in smaller compounded form which describes a compounding cycle given as under:

Multiple Compounding:

$$\text{Future Value of annuity} = CCF (\text{constant cash flow}) * (1 + (i/m))^{m*n} - 1/i/n$$

Once we have calculated the future value of the annuity, it is very easy to calculate the present value using the well-known interest rate formula.

Annual Compounding (at end of every year)

$$PV = FV / (1 + i)^n \quad n = \text{life of Annuity in number of years}$$

Multiple Compounding:

$$PV = FV / [1 + (i/m)]^{m*n} \quad i = \% \text{ interest per year}$$

- More than once per year i.e. Monthly ($m = 12$), Quarterly ($m = 4$), Six-monthly ($m = 2$).
- n = number of years

Now let's talk about another kind of cash flow pattern called perpetuity.

The difference between Annuity and Perpetuity is that the Perpetuity is an ongoing concern, it is never ending stream of annuities, whereas an annuity is for a limited period.

Perpetuity:

"It is defined as an annuity with an infinite life making continual payments."

In real life, we see the example of perpetuity in the retirement plan. For Example, you might plan to save a sufficient amount of money & invested in a particular security or investment that will give you steady & consistent rate of return on every month or quarter and this represents a constant cash flow amount that we can assume to go as long as you live. Since we are not sure how far we are going to live and we make an infinite series of annuities the formula of Future value of Perpetuity is simpler than that of annuity:

$$\text{Future value of perpetuity} = \text{constant cash flow} / \text{interest rate}$$

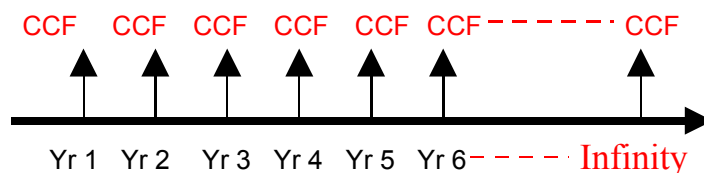
As we assume that, it is never ending and on going so time is irrelevant and is simply dropped out of the equation.

Common Cash Flow Patterns Perpetuity

Perpetuity

Never-ending Annuity. It is a Perpetual or Infinite stream of Constant Cash Flows (CCF) at regular intervals.

$$PV = \frac{CCF}{i}$$



Note: For Perpetuity whose CCF is growing at constant annual growth rate % “g” : $PV = CCF / (i - g)$

Let's do a simple numerical example which will help us what an annuity calculation is like

Example:

Assume that we need to make a basic financial decision, whether to purchase a particular asset or to get it on lease (installments).

A car has a Market Value today of Rs 150,000. If you get the car on Lease Financing, then you are required to pay a fixed regular rental at a fixed interest rate to the Leasing Company. You are allowed to use the car but the ownership of the car stays in the name of the Leasing Company until you complete all your rental payments. **The question is** whether you should Lease the car or Buy it?

The Leasing Company quotes Rs 120,000 every year for 2 years in the form of Car Lease Rental at a Nominal rate of interest (APR interest rate) of 20% pa. Then what is the total Future Value you would have paid after 2 years? You would be paying approximately Rs 240,000 if you do not take into account the time value of money.

Now we calculate the present value of the investment by using Time value of money concept.

First, we need to calculate the future value by using annuity formula

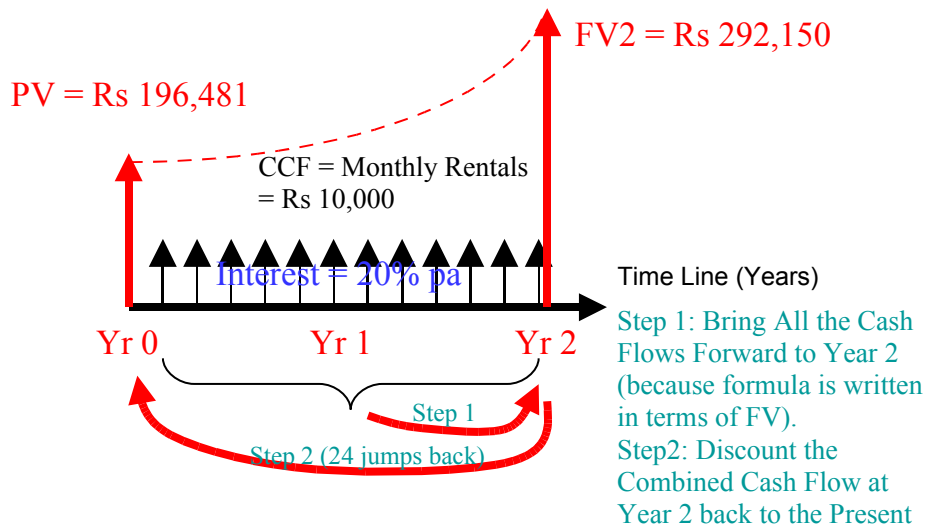
$$\begin{aligned} FV &= CCF [(1+i)^n - 1] / i \\ &= 120,000 [(1+0.2)^2 - 1] / 0.2 \\ &= \text{Rs } 264,000 \text{ (yearly compounding)} \end{aligned}$$

If we deposit the amount annually in a bank at the rate of 20 percent, we would be able to get Rs 264,000 at the end of the second year. Now we will calculate what the present value of this future value is going to be, and for this, we will use the old interest rate formula

$$\begin{aligned} PV &= FV / (1+i)^n \\ &= 264,000 / (1+0.2)^2 \\ &= \text{Rs } 183,333 \end{aligned}$$

The resulting amount is about Rs 33,000 more than what we would have originally paid if we had bought the car rather than lease it

The above calculation, however, was not based on realistic assumptions because car lease rentals are generally paid monthly, rather than annual payments. In fact, you pay Rs 10,000 per month for 2 years. We use periodic interest rate (i/m). Now, what is the future value after 2 years? Our cash flow diagram should present the monthly installments & not annual Payments.

Monthly Lease Rentals Example **Annuity** - Cash Flow Diagram

It can be argued that by paying a rental of 10,000 monthly, we are actually paying Rs 120,000 in a year, so there hardly any difference. But, by not realizing the difference, one is violating the time value of money because cash flows occurring at different points of time cannot be subtracted or added. It is the cardinal principle of Time value of money.

If we have to calculate the future value of the annuity on a monthly basis, we would use the following formula.

$$=CCF \times \left\{ \frac{[(1+i/m)^{n \times m} - 1]}{(i/m)} \right\}$$

Now the $m = 12$ compounding cycle in a year

Putting the values in the formula, we obtain the result as under.

$$FV2 = \text{Rs } 292,150$$

Now, we can calculate the present value of the future value of annuity

$$\begin{aligned} PV &= FV / (1+i)^n \\ &= 292150 / (1 + .2/12)^{2 \times 12} \\ &= 196,481 \end{aligned}$$

The present value of annuity can also be called the intrinsic value of the annuity.

The aforementioned technique allows us to compare the amount of money we are paying to leasing company with the market value of car. It helps you to decide whether you should buy the car on market price or to get it leased. The cost of leasing at 20% p.a. tell us that you have to pay 20% interest & you have to pay more money in leasing as compare to the decision if you buy it .

Perpetuity Example - Retirement Planning

You would like to retire at the age of 60 and receive an income of Rs. 200,000 every year from your Bank Account for as long as you live. How much money do you need to deposit in the Bank Account offering 10% pa so that the Account will pay you Rs 200,000 of interest income every year forever (even though you will not live forever)!

- $PV = CCF / i = 200,000 / 0.10 = \text{Rs } 2,000,000$

This also implies that you would be receiving Rs 200,000 every year for the rest of your life and the money would neither finish nor decrease in amount. This would happen so, because what you would be receiving at the end each year would be interest accrued on the investment that you have made. The money that you are getting is not a part of the investment; instead, it is the yield on your investment. This may sound like a 'big idea' for making money, but in fact, it is not so. Inflation, a macroeconomic syndrome erodes the value of money constantly. If the prevailing inflation rate is 5 percent, then your real return on investment is not 10 percent. If we consider the real rate of return, which is interest rate – rate of inflation, you would see that you need to invest twice as much to guard yourself against inflation.

Another example for perpetuity is Consol Bonds. Consol Bonds were issued by the British Government in 18th century to pay off the smaller bonds that were issued to fund the wars against France. Since the purpose of the bond was to consolidate the past debts, it was named as Consol. These bonds were just like other bonds issued by the government, with the difference that it had no maturity. It implies that the holder of the bond was to receive regular interest payments for an endless period.

Now if we have to invest in such a bond we need to know the price or the present value of the bond. Dividing the interest payment that a Consol bondholder would receive, by the interest rate, we can find the present value of a Consol bond. Suppose that the interest rate is at 10 percent and the promised interest payments to be received are £ 1,000 every year, the price of the bond can be calculated as under

- $PV = CCF / i = 1,000 / 0.10 = £ 10,000$

With this example, the discussion on discounted cash flows, annuities, and perpetuities is concluded. We would study the capital budgeting techniques in the next lecture.

CAPITAL BUDGETING AND CAPITAL BUDGETING TECHNIQUES**Learning Objective:**

After going through this lecture, you would be able to have an understanding of the following concepts.

- **Capital Budgeting**
- **Techniques of Capital Budgeting**

Today, we will discuss Capital Budgeting—one of the most important topics in financial management.

Capital budgeting is about investment in fixed assets. In addition, another type of investment could be in working capital, which we would study later. Fixed assets are the part of long-term assets in the balance sheet and working capital is net position of current assets and current liabilities on the balance sheet.

We need to understand why capital budgeting is so important and why do we have to invest in fixed assets? The answer is simple; the equipment or machinery and other fixed assets depreciate over a period, they lose their productivity and get obsolete after sometime. These assets need to be replaced with new assets. This replacement involves investment in fixed assets.

Moreover, if a company intends to start a new project, Capital Budgeting techniques are employed to assess the financial viability of the project. Suppose, for instance, a company wants to introduce a new soap and launching of the new product demands changes in the manufacturing process, the company will have to purchase new equipment in the form of fixed assets. Capital budgeting is a technique used to evaluate the value of investment and projects in fixed assets. It is also used to assess the working capital requirements. Combined together it helps the company management to decide whether the new venture should be taken up or not.

Capital budgeting is a decentralized function. In big corporations, this function is not an individual's job, rather, different departments and teams are assigned to work on different aspects of capital budgeting. Department managers prepare the budget for fixed assets in coming years, which is quite helpful in capital budgeting. Besides, there are project managers who make the budget for a new project; the cost accountants 'count the cost' and assess the expenses to be incurred; the market researches provide their input about the consumer psychology and sales potential. There may be as many departments involved in capital budgeting, as there are present in an organization.

The biggest challenge in capital budgeting is to keep finding the valuable projects, i.e., projects that may add to the value of the firm. You must be familiar with the basic objective of financial management by now, which is to maximize shareholders' wealth. This is possible only by investing in the projects, which have positive net present value, which in effect will increase the shareholders' wealth.

Most of the developed companies operate in an efficient market environment. We will discuss efficient markets at length after studying the concept of risk akin to financial decisions. However, to give you an idea, **efficient markets** can be described as highly competitive markets where good business ideas are taken up immediately.

For instance, in Pakistan, about ten to fifteen years ago there was a video game craze. It was initially a good business idea, as it required a very low-level investment, good profit margins, and short payback periods. However, since the markets in Pakistan are quite efficient, the information about the business spread quickly. More and more people started entering into the business and as a result, the profit margins started shrinking and the lucrative business opportunity faded out in three or four years.

The same situation comes across the departmental heads of different companies. They may start a new lucrative project, which may sound more than feasible at a given time. However, the competitors get to know the new business opportunity, and because of market efficiency, those lucrative profits do not remain lucrative anymore.

Techniques of capital budgeting:

Capital budgeting is a mathematical concept in the sense that we have to use different quantitative investments criteria to evaluate whether an opportunity is worth investing in or not.

Some of these techniques of capital budgeting are as under

1. Pay back period
2. Return on investment (ROI)
3. Net Present Value (NPV)
4. Profitability Index (PI)
5. Internal Rate of Return (IRR)

We will assume that the interest rate, or the discount rate, or the required of return, which we use in calculating the net present value is given, later on, when we will discuss the concept of risk, we would see how the discount rate is calculated .

For now, let us talk about the pay back period.

Pay back period:

In this technique, we try to figure out how long it would take to recover the invested capital through positive cash flows of the business.

Reverting back to the cafe example, an initial investment of Rs. 200,000 is required to start the business; Rs 10,000 per month are expected to be earned for the first year, and Rs 20,000 would be earned every month in the second year.

Now according to the aforementioned assumptions, in the first year, you earn Rs.10, 000 per month, which make Rs. 120,000 for the year (twelve months). Since you had invested Rs. 200,000 initially of which Rs. 120,000 have been recovered in the first year, you are still Rs.80, 000 short of recovering your initial investment. In the second year, you would be earning Rs. 20,000 per month, so the remaining Rs. 80,000 can be recovered in the next four months. We can say that the initial invested capital can be recovered in 16 months, or the payback period for this investment is 16 months. The shorter the payback period of a project, the more an investor would be willing to invest his money in the project.

While the payback period is a simple and straightforward method for analyzing a capital budgeting proposal, it has certain limitations. First and the foremost problem is that it does not take into account the concept of time value of money. The cash flows are considered regardless of the time in which they are occurring. You must have noticed that we have not used any interest rate while making calculation.

Now, let us talk about the next budgeting criteria called return on investment.

Return on Investments:

The concept of return on investment loosely defined, as there are a number of ratios that can be used to analyze return on investment. However, in capital budgeting it implies the annual average cash flow a business is making as a percentage of investment. In other words, it is an average percentage of investment recovered in cash every year.

The formula for return on investment is as follows:

$$ROI = (\sum CF/n) / I_0$$

Dividing the average annual cash flow by the initial investment, we can calculate the return on investment.

Example:

Taking the same example of a café, the initial investment of Rs.200,000, Rs 10,000 per month profit in the 1st year in Rs 20,000 per month profit for the second year, we can easily calculate the ROI.

$$ROI = ((120,000 + 240,000) / 2) / 200,000 = 0.90 = 90\%$$

Where, Rs 120,000=cash flow for 1st year at Rs 10,000 per month

Rs 240,000=cash flow for the 2nd year at Rs 20,000 per month.

n=2 years

Return on Investment is also very easy to calculate, but like payback period, it does not take into account the time value of money concept.

A high ROI ratio is considered better and 90% is a very good rate of return but before deciding whether or not this project should be taken up, we should compare this project with the alternative opportunities on hand. It is also important to take into consideration the prevailing rate of inflation in the country so that the returns could be adjusted accordingly. However, we would talk about the inflation rate and market interest rate in more detail later.

The next and the most important criteria for evaluating a capital budgeting proposal is net present value.

Net Present Value (NPV):

NPV is a mathematical tool which uses the discounting process, something that we have found missing in the aforementioned capital budgeting techniques. Net Present Value is defined as the value today of the **Future Incremental After-tax Net Cash Flows** less the initial investment.

The formula for calculating NPV is as follows:

$$NPV = -IO + \sum CF_t / (1+i)^t$$

Where, CF_t =cash flows occurring in different time periods

-IO= Initial cash outflow

i=discount /interest rate

t=year in which the cash flow takes place

Initial cash outflow, being an outflow, is always expressed as a negative figure.

NPV is considered one of the most popular capital budgeting criteria. The disadvantage with the NPV is that it is difficult to calculate since these calculations are based on too many estimates.

In order to calculate the NPV we need to forecast the future cash flows and sales; the discount factor is also an estimate. If the NPV of a project is more than zero, it should be accepted. If two or more projects under contemplation, then the one with the higher NPV, should be accepted. When a company invests in projects with positive NPV, they raise the shareholders' wealth or company's value. This would also increase the market value added and the economic value added for the firm.

Example:

Taking the same example of a café, an initial investment of Rs.200, 000, Rs 10,000 per month profit in the 1st year in Rs 20,000 per month profit for the second year. However, for the calculation of the NPV we would be requiring another important input—the discount rate. Assume the discount rate is 10 percent. Ten percent is what you at least expect to earn from the business. This is the rate of return, which you can get by simply putting your money with a bank. If the business cannot yield more than 10 percent, then it is pointless to take unnecessary headache of setting up a business and running it, since ten percent can be earned with a no-sweat-effort of placing the money with a bank.

Where, CF_t =cash flows occurring in different time periods, i.e., Rs 120,000 in the first year and Rs 240,000 in the second year

-IO= Initial cash outflow = -200,000

i=discount /interest rate = 10 percent

$t = 2$ years

Putting in the values in the formula

$$\begin{aligned} \text{NPV} &= -\text{IO} + \sum \text{CF}_t / i \\ &= -200,000 + 120,000 / (1 + 0.10) + 240,000 / (1 + 0.10)^2 \\ &= -200,000 + 109,091 + 198,347 \\ &= \text{Rs. } 107,438 \end{aligned}$$

At the end of 2nd year, the NPV is +ve, you can also solve this example by monthly compounding if you want to have a more precise answer.

The cash flows at the end of the first year and second year will have to be brought back to the present. The present value of the cash flows occurring at the end of the first year can be calculated by dividing the cash flows by 1 plus discount factor as under.

$$120,000 / (1 + 0.10) = 109,091$$

The cash flow occurring at the end of the second year can be calculated by dividing the cash flow by one plus discount factor squared.

$$240,000 / (1 + 0.10)^2 = 198,347$$

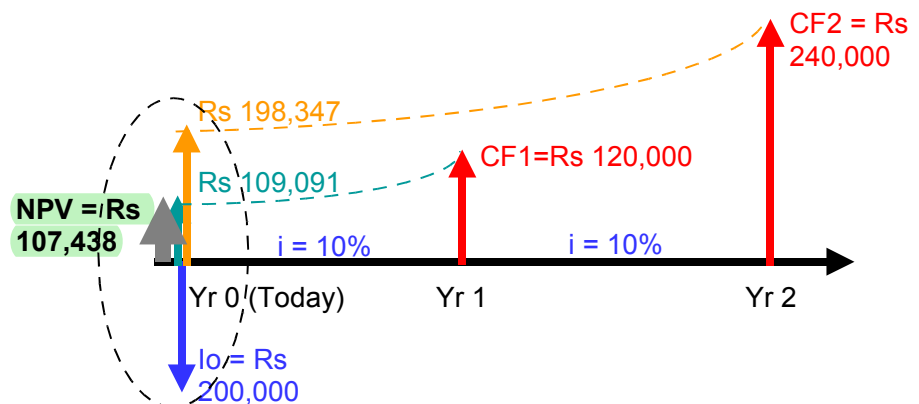
$$\text{NPV} = -200,000 + 120,000 / (1 + 0.10) + 240,000 / (1 + 0.10)^2$$

$$= -200,000 + 109,091 + 198,347$$

$$= \text{Rs. } 107,438 \text{ at the end of second year NPV is +ve}$$

In other words, according to your cash flow forecast and required return, two years of running this business is worth Rs 107,438 in cash to you today. The following diagram can explain the point further.

Investment Criteria N.P.V (Café Example – Cash Flow Diagram)



The next criterion that we would talk about here is the profitability index, or the cost-benefit ratio.

Profitability Index:

It is quite similar to the NPV in terms of concept and calculation. Profitability index may be defined as the ratio of the present value of future cash flows to the initial investment.

The profitability index can be calculated using the following formula.

$$\text{PI} = [\sum \text{CF}_t / (1 + i)^t] / \text{IO}$$

Those projects with a profitability index ratio of more than one ($PI \geq 1.0$) are considered acceptable. Here it is important to mention that those projects, which are ranked as acceptable using the NPV method, would also be acceptable on the profitability index criteria.

Example: The profitability index for the café example can be calculated as under.

$$PI = [120,000 / (1 + 0.1) + [240,000 / (1 + 0.1)^2] / 200,000$$

$$= (109,091 + 198,347) / 200,000 = 1.54$$

$$PI = 1.54 > 1.0$$

Therefore, the project is acceptable. Notice that we have taken into consideration the annualized return. The same can be calculated using the monthly returns with a slight adjustment in the formula as we have studied in the previous lectures. If there were two or more projects that need ranking, the one with the highest profitability index would be acceptable.

Let us now talk about the fifth and the final capital budgeting criteria of our course, known as Internal Rate of Return (IRR).

Internal Rate of Return (IRR):

IRR is a widely used and an important measure, which is more common in practice than the NPV. IRR, unlike NPV that is expressed in dollar amounts, is always quoted in terms of percentage, which makes it comparable to the other market interest rates or the inflation rate.

IRR calculation involves the same equation that we have earlier used for the calculation of NPV. The only difference is that while calculating IRR we would set the value of NPV equal to zero and then solve the equation for the value of 'i'. In other words, the value of 'i', at which the net present value of the project equals zero would be considered as the internal rate of return of the project.

It is important to remember that unlike NPV calculation, the value of IRR is constant in every year for the life of the project. While working out the NPV, we can change the discount rate for every single year, but for IRR you would come up with a rate that is constant and fixed for every single year in the life of the project. Another simplistic explanation of IRR can be that it is the break-even rate of return. In other words, at this rate of return, we would be able to recover the initial investment in project's lifetime.

IRR is calculated by a trial and error method or iteration. Finding the value of an unknown variable may involve solving of higher degree polynomial equations and the easiest way to go about it is to use trial and error method.

In a trial-and-error method, we tryout a value of 'i', and see if the equation comes to the value of zero; if it does not, try another value, even if the second value does not bring the equation down to zero and so on. The higher the IRR, the better it is considered, however, which value of the IRR can be considered as acceptable is difficult to measure. We would discuss more details of it in the coming lectures.

Another important distinction needs clarification here is that the internal rate of return is different from the discounting rate that we use in the calculation of the NPV. In the NPV formula, we used the discount rate as the required rate of return that we expected the project to generate. In case of IRR, we used the existing cash flows to find the forecasted return. These two different interpretations of 'i' should be kept in mind while calculating NPV and IRR.

We can calculate the IRR for the café project in the following manner. Using the same formula of NPV, we can put the values in the formula

IRR Equation:

$$NPV = -IO + CF_1 / (1 + IRR) + CF_2 / (1 + IRR)^2$$

$$= 0 = -200,000 + 120,000 / (1 + 0.1) + 240,000 / (1 + 0.1)^2$$

Solving the equation assuming IRR to be 10 percent, we have obtained a figure of 107,483, which was calculated as our NPV for the café project. However, in order to bring the NPV down to zero, we need

to apply a higher rate as an assumed IRR. If we assume IRR to be 50 percent the equation can be solved as follows.

$$NPV = -IO + CF_1 / (1+IRR) + CF_2 / (1+IRR)^2$$

$$= 0 = -200,000 + 120,000 / (1+0.5) + 240,000 / (1+0.5)^2$$

The calculation gives us a figure of -13,333, which is lesser than zero. In order to bring the value equal to zero we would use a rate lesser than 50 percent.

Trying out various IRR rates, we can finally reach a rate of 43.6 percent at which the value of NPV would come down to -48 which is close to zero. If we try out IRR with more decimal places, we can bring the value of NPV equal to zero. However, with approximation, 43.6 percent is the actual IRR of the project.

Send your query to registrar.

More details about the IRR and the NPV would be discussed in the next chapter.

NET PRESENT VALUE (NPV) AND INTERNAL RATE OF RETURN (IRR)**Learning Objective:**

In this lecture, we will discuss in detail the previous lecture topics that are

- **Net Present value (NPV)**
- **Internal Rate of Return (IRR)**

Net Present value (NPV):

The most important skill in this course is to understand the NPV equation and to calculate NPV as reliably as possible. It is also the most important criteria in capital budgeting. It is very difficult to calculate because different inputs used in Net present value equation are based upon a forecast, which may or may not be accurate e.g. future cash flows and sales. Similarly, when we talk about the life of the project, again we are estimating the duration of the project. We also have to choose subjectively the discount rates to be used, including cost of capital, opportunity cost & required rate of return in the calculation of Net present value. We will discuss how to choose the interest rate when we would talk about risk. In NPV the idea is to bring back each cash flow to the present and then to add or subtract them on present time. The project or investment, which is offering the highest NPV, gets the highest rank.

Formula:

$$NPV = -I_0 + CF_1 / (1+i)^1 + CF_2 / (1+i)^2 + CF_3 / (1+i)^3 + ..$$

Importance of NPV in terms of objectives of Financial Management:

The objective of FM is to maximize the shareholders wealth. Now, there is a direct link between shareholder wealth maximization & NPV. It is mentioned earlier that the value of an asset is determined by the future cash flows it generates. We used these future cash flows & discount them to present and we call that the NPV. Hence, there is a direct link between NPV and future cash flows.

When the management of the company invest in the +ve NPV projects, they increase the economic value added (E.V.A) and they also increase market value added (M.V.A). It should be clear by now that when company invest in +ve NPV projects they brings in value to the company. Increase in the value of the company implies increase in shareholders' wealth.

Example: Let us suppose that you invest Rs 100,000 in a Savings Certificate. After 1 Year you will receive a coupon payment (or profit) of Rs 12,000 and you also reclaim your initial investment (principal).

Solution:

Step 1: Identify the Variables: $I_0 = \text{Rs } 100,000$ $CF_1 = \text{Rs } 12,000$ Life = $n=1$ year Required Rate of Return = $i=10\%$ (assumed), Annual compounding. $CF_{I1} = \text{Rs } 100,000$

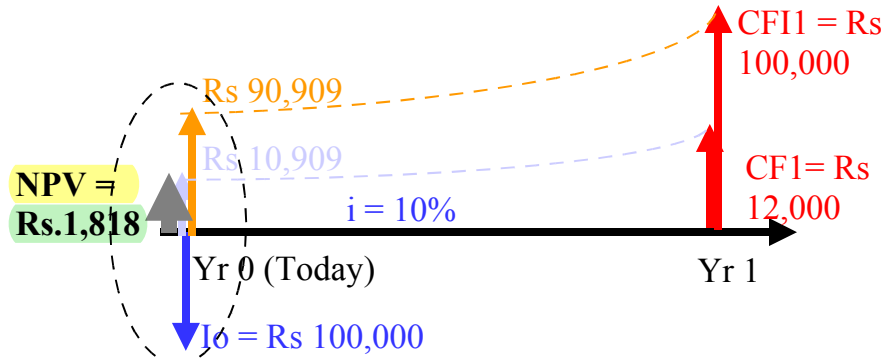
Here, we assume that $i=10$ because which is the opportunity cost as you can place that money in a bank and can earn 10%. Do not forget that you get back your principal investment after 1 Year. This is a positive cash flow and must be discounted back to the present just like any other future cash flow).

Step 2: Solve the NPV Equation

$$\begin{aligned} NPV &= -I_0 + CF_1 / (1+i) + CF_{I1} / (1+i) \\ &= -100,000 + 12,000 / (1+0.10) + 100,000 / (1+0.10) \\ &= -100,000 + 10,909 + 90,909 \\ &= + \text{Rs } 1,818 \text{ NPV positive so investment acceptable} \end{aligned}$$

NOTE: $PV = NPV + I_0 = 1,818 + 100,000 = \text{Rs } 101,818$

NPV Cash Flow Diagram Savings Certificate Example



In diagram initial downward sloping arrow shows the cash out flow and after one year two upward pointing arrows (1. profit 2. return of initial investment) show the cash inflows.

Now let us talk about the Internal Rate of Return or IRR.

Internal Rate of Return or IRR:

IRR is a very commonly used criterion for capital budgeting. It is popular with the managers because it gives a very simple answer in the form of annual percentage and you can compare it to the inflation rate, cost of capital or financing or to the certain financial accounting ratios. The formula uses trial & error method. We talk about the interpretation of IRR in the coming lectures.

The formula is similar to NPV

$$NPV = 0 = -I_0 + \frac{CF_1}{(1+IRR)} + \frac{CF_2}{(1+IRR)^2} + \dots$$

The value of i where NPV is zero is the value of IRR.

IRR represents the Break-even Return on Investment, but the important thing to remember is the difference between IRR & NPV. When you are ranking different projects the ranking you get from NPV may be different from the ranking you get from IRR, because, there is a major difference of interpretation of i between NPV and IRR.

The difference is that in the case of NPV; we are externally specifying the discount rate based on required rate of return. In NPV calculations, you have an idea of your opportunity cost for the capital & you use it as ' i '. As mentioned earlier that rate given by the banks on account is considered as opportunity cost of your capital & you will invest in any project, which earns more than the rate offered by a bank. However, in IRR i is derived from the cash flow pattern of the project. Remember that in IRR project, we do not externally specify the interest rate but we calculated it from the cash flows. Therefore, in the IRR it is what you called forecasted rate of return or an intrinsic rate of return. This is an important difference to keep in mind between NPV & IRR.

Example:

Consider the Same Savings Certificate example for IRR calculation. The only difference is that this time, we will not assume any value for " i " as we had done in the NPV calculation.

We set the NPV = 0 and solve the equation for " **i** " (or IRR).

$$NPV = 0 = -I_0 + \frac{CF_1}{(1+IRR)} + \frac{CFI_1}{(1+IRR)}$$

We add Rs 12,000 & Rs 100,000 as both appearing at the same time.

$$0 = -100,000 + \frac{[(CF_1 + CFI_1)]}{(1+IRR)}$$

$$0 = -100,000 + \frac{[(12,000 + 100,000)]}{(1+IRR)}$$

$$IRR = (112,000 / 100,000) - 1$$

(No need for trial & error because you have one variable & one unknown)

$$= 1.12 - 1.00 = 0.12 = 12 \% \text{ per annum}$$

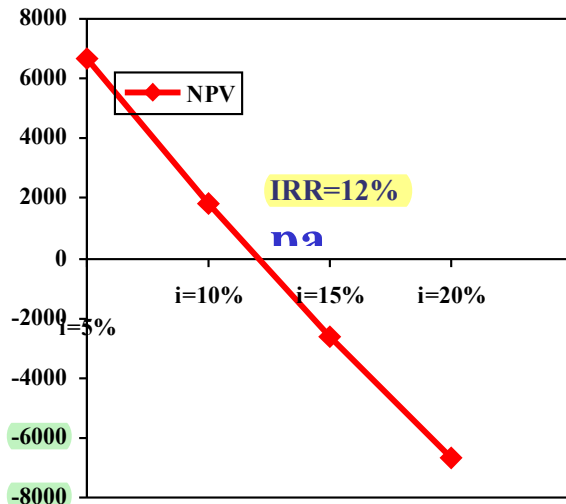
Is that a good IRR, a high IRR or low IRR? These things we will discuss in this & in the next lecture. Now, one very important thing, which you need to consider when you are evaluating an investment proposal, is to look at NPV & to see how it changes as you change the discount rate. This is known as NPV Profile (See Fig.). Logically, when you increase the discount rate, the denominator

becomes larger & you net present value becomes smaller. What you find as a result is a downward sloping line. The point where the NPV is zero would be the IRR for the project.

Graphical Using “NPV PROFILE”

IRR

Estimation



Using a low and a high value for “i”, plot two points on the graph and extend the NPV line. Where the line cuts the horizontal x-axis would be reflect the value of the IRR.

Use this Graphical Technique when:

1. The investment or project life is longer than 2 years.
2. Graphical technique very useful in IRR calculations as there are polynomial equations that are time consuming to solve algebraically in terms of “i”.
3. Comparing the NPV’s of 2 or more investments, to study how sensitive the NPV’s of the different investments are to the discount rate “i”

The next issue is the ranking of different projects, which means given a choice of more than one investment, which project is the best to invest in.

RANKING TWO DIFFERENT INVESTMENTS:

Which Investment is better?

Let us rank two Mutually Exclusive & Independent Investments using NPV and IRR criteria

Mutually Exclusive: means that you can invest in ONE of the investment choices and having chosen one you cannot choose another.

Independent: implies that the cash flows of the two investments are not linked to each other

Example:

Let us consider two investment opportunities. One Investment is the Savings Certificate (which we described earlier) and the second investment is a Bank Deposit of Rs 100,000 at 10% interest compounded annually for two years.

NPV & IRR Numerical

Comparing the 2 Investments

Since we have calculated the NPV and IRR for the Savings Certificate, we would calculate the NPV and IRR only for the Bank deposit rate.

Bank Deposit Example

$$FV = PV (1+i)^n = 100,000 \times (1.10)^2 = 121,000$$

$NPV = -100,000 + 10,000/(1.1) + 11,000/(1.1)^2 + 100,000/(1.1)^2 = 100,000 + 9,090 + 91,736 = + Rs 826$

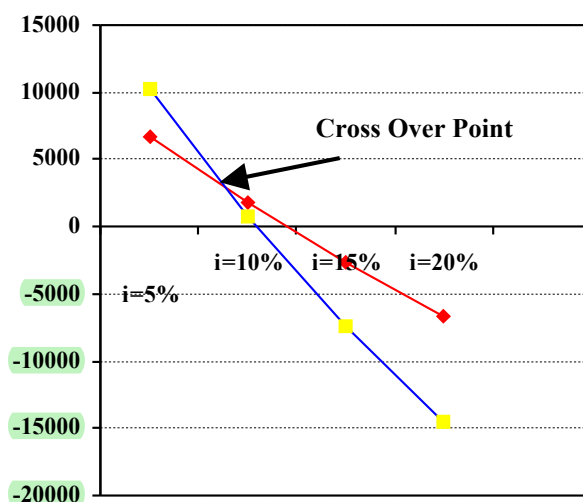
IRR: $NPV = 0 = -100,000 + 10,000/(1+IRR) + 111,000/(1+IRR)^2$... by trial & error IRR = 10.5%
Compare the Investment 1 (Savings Certificate) to Investment 2 (Bank Deposit):

Savings Certificate Bank Deposit

NPV (i=10% pa)	+ Rs 1,818	+ Rs 826
IRR	12% pa	10.5% pa

Savings Certificate appears to be a better investment because it offers both a higher NPV and a higher IRR.

Graphical Comparison of 2 Investments **“CROSS-OVER IRR”**



The above diagram shows NPV Profiles of investments intersect at the Cross Over Point. Slope of Bank Deposit investment is steeper because larger cash flows (Rs 111,000) are taking place later in time (2 years instead of 1 year for Saving Certificates). Size of the Discounting Factor grows exponentially with time so NPV graph falls much faster. The IRR at this Point is 8.8%.

At this point, the NPV of both the investments is equal at about +Rs 2,950
When IRR is less than 8.8% (Cross-over IRR) then the NPV of Bank Deposit is higher!

Investment Criteria

IRR Interpretation - How high is high.

Macro Aspects

Inflation:

An IRR, which is considered low for a medium inflation country like Pakistan, may be considered high for a low inflation country like USA, Japan, and Singapore where inflation is below 5%.

Risk Free Rate of Return:

Recall our discussion from earlier lecture on Interest Rates and Money Markets.
In Pakistan, we use the Government T-Bill rate, which varies from 7% to 12% per annum depending on the Money Market. Considering the risk-free rate of return the IRR on investment is not very good. We will talk more about this after we study RISK.

Investment Criteria**IRR Interpretation (Micro Aspects)****ROA & ROE:**

If the Investor has an existing running business that generates cash flows, then any new project that matches or exceeds the returns of the existing business is worth considering.

Problem: ROA & ROE are Financial Accounting Ratios based on Net Income (not cash) & Historical Cost or Book Value (not market value) whereas IRR is based on Cash and Forecasted Market Value. The financial ratios are calculated based on the profit reported in the income statement, whereas the IRR takes into account the cash flows rather than the accounting profit in the calculations.

Weighted Average Cost of Capital (WACC) or Hurdle Rate:

If the Investors an existing operating business that runs on borrowed money (or financing) then the Investor (the borrower) bears the cost of interest, say 18% pa in Pakistan. Obviously, the rate of cash generation should exceed the rate of interest payment. The IRR of a new project should exceed the WACC. We will discuss this in detail when we study Capital Structuring. When IRR is above the WACC, the excess return represents surplus that increases shareholders' wealth. The details on WACC would be further discussed in Capital Structure determination.

PROJECT CASH FLOWS, PROJECT TIMING, COMPARING PROJECTS, AND MODIFIED INTERNAL RATE OF RETURN (MIRR)

Learning Objectives

After completing this lecture, you would be able to understand

- Cash flows relevant to NPV and IRR
- Project timing on the cash flows relationship
- Steps involved in preparing pro forma cash flow statement
- Project options
- Problems with IRR
- Modified Internal Rate of Return
- Problems of comparison among projects of unequal life

Today, we are going to talk about project cash flows, along with the concepts of net present value (NPV) and internal rate of return (IRR), as they relate to the project cash flows. NPV and IRR are important and widely used techniques of evaluating investment in real assets. Before going into details of these techniques, one must have a clear understanding of what these real assets are.

Real assets projects may also include entire businesses. Investors have the option of investing in running businesses, which are also a collection of assets. The way a project can be evaluated using the IRR and NPV techniques, the cash flows being generated from a business can also be evaluated in the same manner.

The actual NPV and IRR for real assets are not very easy to calculate despite having an easy formula, because the inputs used in the formula are only estimates. Cash flows, the basic input is based on forecasts, hence majority of errors that may take place in calculating the actual NPV or IRR of any project may be because of forecasting errors. The next important challenge is to assess or forecast the anticipated life of the business, which could only be based on an educated guess. Although, you might have studied in financial accounting about the perpetual concern, however, in reality businesses have finite life. Another important input is the discount rate. Picking the right discount rate is not an easy task either. However, we will talk more about discount rates when we would discuss the concept of risk. All these factors combined together make the calculation of NPV very difficult.

Let us begin with a relatively simple formula for calculating net incremental after tax cash flows.

Net incremental after tax cash flows = net operating income + depreciation +

Tax savings from depreciation + net working capital + other cash flows

- Net operating income is obtained from the income statement
- Depreciation is added back since it is a non-cash expense
- Net working capital requirements for the project as estimated are also added
- Other cash flows which are associated with NPV

Other Cash flows relevant to the NPV of the project

Broadly speaking, these other cash flows can be categorized into three types

1. Opportunity costs relevant to the cash flows of the project

Suppose you are to invest in a new project, a small production unit with 4 weaving looms. You would also need to have a piece of land where the machinery would be installed. Suppose further, that you already have that piece of land. While calculating the NPV for the project, you would have to include the value of the land that you are using. Although you are not buying that land, but that land has a certain market value. You could have sold that land at the market price and by not doing so you are incurring an opportunity cost.

2. Cash flows associated with externalities

Externalities in financial terms may be defined as incidental cash flows that arise because of the effect of new project on the existing or running business. For instance, if a company adds a new product to its produce line, the launching of the new product can adversely affect the sales revenue of the existing product line. This phenomenon of competition among the brands of the same company is also known as cannibalization. When an entrepreneur is embarking on a new project, he might either hurt or increase the sales of the existing products and that is an externality. While calculating the net incremental after tax cash flows, the incremental effect of these externalities, whether negative or positive should be included in the calculation.

3. Sunk costs:

Sunk costs need to be excluded while calculating the incremental cash flows. Sunk costs are the costs that have already incurred in the past. Whether you decide to invest your money in the new project or not, the sunken costs cannot be recovered. For instance, if a company has purchased an import/export license and a few years after the company decides to export a certain commodity, the cost incurred to purchase the license would not be included in the cash flows. Whether the company decides to undertake the new export project or not, the license fee cannot be recovered.

Timing of the projects:

The next important issue that we need to look at is the different times in which project or business cash flows have incurred. Broadly speaking, there are three phases.

1. Initiation of the project, the time of investment
2. Life of the project
3. Termination of the project

Time of investment:

Time of business refers to the initiation time when the initial cash outflow occurs. In addition to the investment in the fixed assets, you may also have net working capital requirements or mobilization requirements to get the project started. You can add these two types of initial cash outflows since they are occurring at the same point in time. You might also have to subtract any tax paid on the sale of old assets to get a net figure for the initial cash outlay. As we discussed earlier, we need to invest in new assets if the old assets become less productive. These old assets, despite losing their productivity have some market value at which they can be disposed off. If the market value of the project is higher than its book value, the company earns a gain on the sale of the asset, which may be taxable¹.

Life of the project:

This second phase encompasses a major duration since it is concerned with the cash flows that occur during the life of the project. The relevant cash flows for the period would be the operating cash flows, in the form of cash receipts from sales revenue and other income, as well as cash expenses or payments in the form of operating, marketing and administrative costs. It is important to keep in mind that all these revenues and costs would be seen on a cash basis. We would also need to take into account if there are any tax savings that are coming about because of showing increased depreciation. The change in depreciation takes place as the new assets are included in the business and these new assets are usually depreciated at an accelerated rate in comparison to the old replaced assets, which were being depreciated at a low rate in the final year of their useful life. The amount of depreciation could also increase if the new asset has a high price, the amount of depreciation charged to the asset would also be high. Since depreciation is a non-cash expense, it has to be added back to the net profit to get the cash flows. If the new asset has replaced an old one, the difference between the depreciation of the two would be added to the cash flows.

Termination of the project:

Termination of the project refers to the period when the project life ends. At this time, we need to take into account the salvage value of the project assets, the price at which the assets can be sold out. Selling an asset results in a cash inflow—represented by salvage value. In addition, you would also recover the working capital that you have invested in the business at the beginning. This would be another cash flow because of liquidating accounts receivable and other accrued assets.

Steps involved in preparing estimated cash flow statement:

Cash flow statement is a consolidated statement of changes in financial position. Following are the steps involved in preparing a cash flow statement.

- Net Operating Income (from Performa P/L)
- Add back Depreciation (non-cash expense)
- Add Additional Net Working Capital Required
- Subtract Additional Investments in Fixed Assets
- Add Any Tax Savings from Change in Depreciation
- Add Any Cash from Sale of Assets at Salvage Value
- Add Any Tax Savings from Gain on Sale of Assets

¹ In certain countries, like Pakistan, capital gains are not taxed at all

The following example would help you in understanding the composition of a cash flow statement based on the pro forma profit & loss account.

PRO FORMA (FORECASTED) CASH FLOW
A SAMPLE YEAR IN PROJECT'S LIFE

	Amount in Rupees
Net Operating Income (from Pro forma P/L):	1,000
Cost Savings (2000) + Revenues (1000) – Expenses (2000)	
Add back Depreciation (non-cash expense):	100
Add Additional Net Working Capital Required	200
Subtract Additional Investments in Fixed Assets	(500)
Add Any Tax Savings from Change in Depreciation	50
Add Any Cash from Sale of Assets at Salvage Value	100
Add Any Tax Savings from Gain on Sale of Assets	50
NET CASH FLOWS	1000

Explanation:

The main items we need for preparing is the net operating income, which is an estimated income as it has been obtained from the pro forma income statement. The net operating income is calculated by adding revenues to cost savings minus expenses, which in our example is Rs.1000. The next item used in preparing a cash flow statement is the depreciation. Depreciation is added back to the net operating income, as it is a non-cash expense. Assume the depreciation to be at Rs.100, which would be added to the net operating income. Another thing that we need to add to the net operating profit is the additional working capital requirements, which in our example is assumed Rs 200.

We would also need to subtract any additional investment in fixed assets. Investments in fixed assets result in cash outflows, which need to be subtracted to get net cash flows. We would also add any tax savings that come about because of changes in depreciation. When you show more depreciation, your taxable income reduces and as a result, you have to pay lesser taxes. Depreciation is a non-cash expense but tax is paid in cash form. By paying less tax, the business is in fact saving tax by applying a high depreciation rate. You would also add any cash flow resulting from the sales of assets. Assets that are sold at salvage value represent cash inflows. Any tax advantage on the gain would also be added. Based on these additions and subtractions, we arrive at the net cash flow figure as shown in the example.

Management overestimates the cash flows. They portray a very optimistic picture of the cash flows and the NPV, which is also known as an upward bias in NPV calculations. This is one of the ways of window-dressing.

Project Options:

Some of the companies in certain situations accept projects with negative NPV, or NPV less than zero. Although, the mathematical details would be discussed in the later lectures, we need to understand why companies do that.

Companies invest in projects with negative NPV because there is a hidden value in each project. This hidden value is an opportunity, which is known as an option. These opportunities and options carry some value. For instance, there are a number multinational companies investing in China these days, even though, the net present value of there projects might be significantly lower than zero. It is because they are sacrificing short and medium term cash flows for a long-term market share. They see China as a potential market owing to its huge market size, and for long-term benefits, they are willing to invest in projects with negative net present value.

The same concept is true for technology industry. We can take the example of Amazon.com, a web based company where the CEO and the managers are willing to invest even if the net present value is negative. The management believes that the growth of the market is such that the negative net present value would be compensated in future by heavy downpour of positive cash flows later in the life of the project. You must keep in mind that these options are hidden and might not be very visible to you. ☰

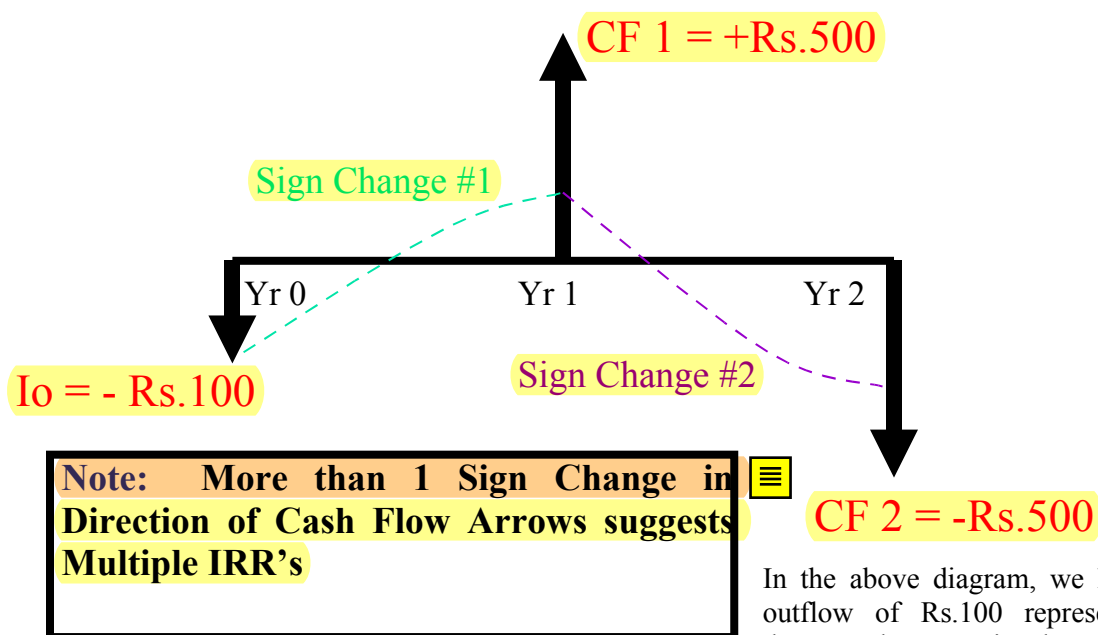
When we talk about the option to abandon a project, the abandonment too has a value. For instance, if you find that one of the projects has started losing money, you would have the option to end the project

and thereby cutting the losses. This is the abandonment value of the project. In contrast, for larger project the abandonment option might be very difficult to exercise. When we make decision of investing cash in a project, we bear the opportunity cost of not investing the cash in another project and thereby losing option. Locking up your money & time in a bad project today can reduce your Option Value to invest in better opportunities in future

Problems with IRR:

Let us now discuss some problems with the calculations of IRR. The problems with calculation of IRR come about when the project's useful life is for more than two years. Another problem arises when there are non-normal cash flows or one or more net cash outflow at some point in future (in addition to the initial investment outflow). This creates multiple real roots (or more than one IRR's) that bring the NPV of the project equal to zero.

Let us take a simple example for explanation of the concept. For instance, you have made an initial investment (outflow) of Rs.100, the Net Cash Receipts (inflow) at the end of Year 1 is of Rs.500, and net loss (outflow) at end of Year 2 is of Rs.500. The cash flow pattern can be explained in the diagram below.



In the above diagram, we have a cash outflow of Rs.100 represented by a downward arrow in the year 0. The upward arrow represents cash inflow of Rs.500 in the year 1, and the last downward arrow in the second year represents another cash outflow of Rs.500. The IRR of the project can be calculated as under

IRR Equation:

$$NPV = 0 = -100 + 500/(1+IRR) - 500/(1+IRR)^2$$

Solve by Iteration (or Trial & Error):

IRR = 38% and 260% approx!

Solving the equation, we come up with two values of IRR. Which of the two values is correct? The best way to deal with this situation is to leave both the found of rates and use another important tool for the calculation of the IRR known as Modified Internal Rate of Return.

Modified Internal Rate of Return:

The logic used in this technique is to separate the cash inflows and outflows for each year and use a market discount rate "k" (or the cost of capital). Plotting the cash inflows and outflows on a diagram, we would keep them separate instead of finding the net cash flow. The next step is to discount all the future cash outflows and discount them to the present. The third step is to compound the company's cash inflows to the future end period, which represents the end of the life of the project. The idea of compounding the cash inflows is on the assumption that they are reinvested at the cost of capital. After doing the compounding and discounting of cash flow, we use a rate at which the future value of

cash inflows is equal to the present value of cash outflows. The rate at which the two equate is known as the Modified Internal Rate of Return. The formula for the MIRR is given as under.

Find the Modified IRR (MIRR) using:

$$(1+\text{MIRR})^n = \frac{\text{Future Value of All Cash Inflows....}}{\text{Present Value of All Cash Outflows}}$$

$$(1+\text{MIRR})^n = \frac{\text{CF in} * (1+k)^{n-t}}{\text{CF out} / (1+k)^t}$$

Now the question arises as to why are we using two different interest or discount rates in the equation. One of the interest rate is the MIRR and the other is the discount rate used in the NPV calculation (opportunity cost of capital).

Life of the project:

In our previous example, where we compared a saving certificate to a bank deposit, the lives of the two investments were not of the same duration. The net present value of the two projects is not comparable due to the difference in life spans. There are two approaches used to make two projects with different life spans comparable.

Common Life Approach:

In order to make the two investment opportunities we equate the life of the two projects. We would repeat the cash flow pattern of each project over a horizon that matches the least common multiple of the lives of the two projects. For instance, if there are two projects, and the life of first project is one year and that of the second is two years, the least common multiple would be two and the cash flow pattern of the project would be repeated for the next year, in order to make the two projects comparable. Similarly, if first project has a life of two years and second project has a life of three years, the least common multiple would be six. In that case, the cash flows of the first project would be repeated thrice and that of the second project would be repeated twice. Having equated the lives of the project the net present value of both the projects can be calculated and compared.

Equivalent Annual Annuity Approach:

The other approach is to calculate the NPVs of the projects and multiply the result with the annuity factor. This method converts the projects of different lives into annuity of the same duration in time.

Inflation consideration

- Use Inflation Discount Factor: Multiply each future cash flow term in the NPV equation by the Inflation Discount Factor: $1 / (1+g)^t$. Where g = % inflation per year and t = number of years.

SOME SPECIAL AREAS OF CAPITAL BUDGETING**Learning Objectives:**

In this lecture, we will discuss some special areas of capital budgeting in which the calculation of NPV & IRR is a bit more difficult. These concepts will be explained to you with help of numerical example.

As it is mentioned in the previous lectures that we are studying the area of capital budgeting as it relates to projects, which means investments in real assets (land, property etc.) The major difficulty in the NPV calculation is your ability to forecast the cash flows. Therefore, it is necessary that one should spent time on this so that the cash flow forecast is accurate.

We, have a simple formula to calculate the cash flows. The way we define the net Incremental after tax cash flows for the purposes of this course is

Net After-tax Cash Flows = Net Operating Income + Depreciation + Tax Savings from Depreciation + Net Working Capital required for this project + Other Cash Flows

The things we left out from the formula given above are certain incidental cash flows (Include Opportunity Costs and Externalities but Exclude Sunken Costs.)

Two Major Criteria of Capital Budgeting:

1. Net Present Value (NPV)
2. Internal Rate of Return (IRR)
 - a. Combined View: NPV Profile (NPV vs i Graph)

The NPV is the most important because it has a direct link with shareholders wealth maximization. 

Let us discuss in detail about the difficulties faced in NPV & IRR with the help of certain numerical examples and explanations.

First, we would discuss the case of Multiple IRRs.

Multiple IRR:

In this case, you have a project with certain cash flows that are not normal and when you try to calculate IRR you obtain more than one IRR answer. This is the case where you have more than one sign change taking place in your cash flow diagram. Sign change means that you have two adjacent arrows one of them is downward pointing & the other one is upward pointing. In general, our cash flow diagram starts with down ward pointing arrow (Investment) and it is followed with series of upward pointing arrows (net incoming cash) during the life of project. However, during the life of project if you have any net cash outflow or downward pointing arrow then that would be second sign change and you can expect to have multiple answer for IRR.

In this particular case, calculating the NPV and setting it equal to zero to calculate IRR will give you two answers & both of them would be wrong.

The alternative is to use Modified IRR or MIRR approach.

MIRR Approach:

The logic behind MIRR is that instead of looking at net cash flows you look at cash inflows and outflows separately for each point in time. Discount all the Outflows during the life to the present and Compound all the Inflows to the termination date. Assume reinvestment at a Cost of Capital or Discount Factor (or Required Return) such as the risk free interest rate.

The MIRR represents the discount rate, which will equate the Future Value of cash inflows to Present Value of cash outflows.

Formula:

$$(1+\text{MIRR})^n = \frac{\text{CF}_{\text{in}} * (1+k)^{n-t}}{\text{CF}_{\text{out}} / (1+k)^t}$$

Modified Internal Rate of Return (MIRR) would provide us with an answer, which is entirely different from our previous IRR calculations

Example:

A project with the following cash flows: Initial Investment = -Rs100, Year 1 = +Rs500, Year 2 = -Rs500

If we use standard NPV equation to calculate the IRR

$$\text{IRR Equation: NPV} = 0 = -100 + 500 / (1+\text{IRR}) - 500 / (1+\text{IRR})^2$$

You would come up with 2 answers

IRR = 38% and 260%

Both of these answers are incorrect. Therefore, we will use the modified IRR approach to calculate the actual IRR for this project.

MIRR Approach (Assume Cost of Capital $k = 10\%$):

$$(1+\text{MIRR})^n = \frac{\text{CF}_{\text{in}} * (1+k)^{n-t}}{\text{CF}_{\text{out}} / (1+k)^t}$$

We use 1.1 as compound factor because we assume “ i ” = 10% = Risk free rate return. Here ‘ t ’ refers to the time in which a particular cash flow occurs, while ‘ n ’ is the total life span of the project.

$$(1+\text{MIRR})^2 = \frac{500 * (1+0.1)^{2-1}}{(100 / 1.1) + (500 / (1+0.1)^2)}$$

$$(1+\text{MIRR})^2 = 550 / 513 = 1.07$$

$$\text{MIRR} = 0.0344 = 3.44\%$$

This answer is entirely different from the previous answers that we got from calculating the IRR. However, MIRR gives you the best possible answer and the most realistic too.

Now, let us talk about the case of comparing projects with different lives.

NPV of Projects with Different Lives:

Suppose that you have two projects having different life spans. It is not entirely accurate to calculate NPV's in simple manner and to compare them and pick the project with higher NPV. Because you are comparing a certain project that is generating cash flows for a short period of time with another project that is yielding cash flows over a longer time. We use following two approaches to rank these kinds of projects.

1. Common Life Approach:

In this approach, the idea is quite simple. You need to bring all the projects to the same length in time. In other words, you are required to convert all the projects to the identical life span. You can do that by finding least common multiple for common life. For example, if you are comparing two projects one has life of 4 years and the other, which has a life of 5 years, the least common multiple is 20 years. Sketch out the cash flow diagram and repeat the cash flow for each of the project such that they fit in exact number of time in 20 years. In case of project with a life of 4 years, you can replicate the cash flows 5 times in a period of 20 years. . In case of project with a life of 5 years, you can replicate the cash flows 4 times in a period of 20 years. Compute the NPV of each project over the common life and choose the project with the highest

NPV.

2. Equivalent Annual ANNUITY (EAA) Approach:

In this case, our logic is to find out that for a particular project of limited life giving you the certain net present value calculated in a simple way, what kind of yearly annuity gives the same NPV. You can then compare annual annuity of each project and choose the highest. You are comparing cash flow of two projects both of which are taking place in a period of one year only. You can also convert the cash flows of the project to the perpetuity, which is infinite, and then you can compare the NPV's like of different projects. That is also correct since life spans are identically infinite.

Example:

We have 2 Projects with following Cash Flows:

Project A: $Io = -Rs100$, $Yr 1 = +Rs200$

Project B: $Io = -Rs200$, $Yr1 = +Rs200$, $Yr2 = +Rs200$

Simple NPV Computation (assuming $i=10\%$):

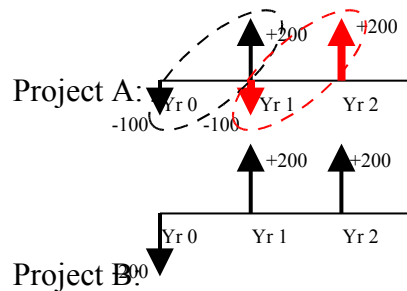
$$\text{NPV Project A} = -100 + 200/1.1 = +Rs 82$$

$$\text{NPV Project B} = -200 + 200/1.1 + 200/(1.1)^2 = +Rs 147$$

Conclusion from Simple (or Normal) NPV Calculation is that Project B is better. It is incorrect because here we are comparing apples to the oranges since the project lives are different!

Common Life Approach:

Common Life Span = Least common multiple = 2 Years (because this is the shortest cycle in which both project lives can exactly be replicated back to back).



In this Cash Flow Pattern of A is repeated exactly 2 times to cover the life of the longer Project B. The project A's outflow 100 & inflow of 200 then we replicate it with down ward pointing arrow with 100 and upward pointing arrow with 200 amount in the 2nd year. Project B remains unchanged

Common Life (C.L.) NPV's:

$$\text{Project A C.L. NPV} = -100 + [(200-100)/1.1] + 200/(1.1)^2 = +\text{Rs } 156$$

$$\text{Project B C.L. NPV} = \text{Same as before} = +\text{Rs } 147$$

Now our conclusion has changed! After doing the Common Life NPV, Project A looks better. The Simple NPV of Project A was + Rs 82 but after increasing its life to match Project B's, the NPV of Project A increased. It is the correct answer. Also, note that how the NPV of A increased from 82 to 156 (almost double) because you double the life of the project.

Now we solve this problem with Equivalent Annual Annuity Approach

Equivalent Annual Annuity Approach:

In this we are explaining that how we can achieve same NPV value from an annuity stream. Here, we are doing a back calculation that we knew the NPV's but which annuity stream they are representing with in the life span of the project. Then we compare the annual annuity of both projects. The life span remains same

Example:

Start with the Simple (or Normal) NPV's calculated earlier (at $i = 10\%$):

- Project A Simple NPV = + Rs 82
- Project B Simple NPV = + Rs 147

To find EAA

Multiply the Simple NPV of each project by the EAA Factor

EAA FACTOR = $(1+i)^n / [(1+i)^n - 1]$ where n = life of project & i = discount rate

$$\text{Project A's EAA Factor} = 1.1 / (1.1 - 1) = 11$$

$$\text{Project B's EAA Factor} = 1.12 / (1.12 - 1) = 5.76$$

EAA for each project

$$\text{Project A's EAA} = \text{Simple NPV} * \text{EAA Factor} = 82 * 11 = + \text{Rs } 902$$

$$\text{Project B's EAA} = 147 * 5.76 = + \text{Rs } 847$$

Conclusion: Project A is better. Same conclusion as Common Life Approach but of course the numbers for EAA and NPV are different.

Practical view:

Companies and individuals running different types of businesses have to make the choice of the asset according to the life span of the project. For instance, a tailor shop owner would have to decide whether to invest in a sewing machine that has a useful life of ten years or to invest in another machine with a

useful life of three years. These decisions are important since they involve major cash outflows of the business. There are advantages & disadvantages associated with different life span.

Different Lives & Budget Constraint:

Companies and individuals running different types of businesses have to make the choice of the asset according to the life span of the project.

Advantages of asset with a long life:

The advantage of a longer asset life is that the cash flows from the project become more predictable, since there are lesser cash outflows occurring during the life of the project.

Disadvantage of asset with very long life:

It does not give you the opportunity (or option) to extract full value of asset and replace the equipment quickly in order to keep pace with technology, better quality, and lower costs.

Advantages of asset with short life

The advantage of a short life asset is that the investor, by making reinvestment in the asset of a superior quality, lowers down the costs and updates the project to the new technological requirements.

Disadvantage of assets with very short life:

The disadvantage is that the money will have to be reinvested in some other project with an uncertain NPV and return so it is risky. If a good project is not available, the money will earn only a minimal return at the risk free interest rate.

While exercising the option of different project timing, the projects can be compared by applying Common Life and EAA Techniques to quantitatively.

Budget Constraint

We have been addressing the issue of capital budgeting with very idealistic assumptions. In practical life, individuals and companies have a limited amount of money and limited human resources in terms of either skill or numbers. It can be argued that the firm can also meet their requirements by borrowing. IN real life, managers may avoid borrowing to limit their risk exposure. This prevents them from undertaking projects with high positive NPVs that would have added to the firm's value and maximized shareholder wealth!

CAPITAL RATIONING AND INTERPRETATION OF IRR AND NPV WITH LIMITED CAPITAL.

Learning Objective:

After going through this lecture, you would be able to have an understanding of the following topic

- **Capital Rationing**
- **IRR and NPV interpretation with limited capital**

In this lecture, we would discuss the practical side of capital budgeting addressing the problem of allocating your money among the different possible projects, where the amount of money to invest is limited.

Companies ration their capital and investments among different opportunities. Similarly, countries use rationing. For example, some countries ration food. Capital Rationing provide practical basis to the capital budgeting because the decision of capital budgeting are made within limited financial resources of the company in real life situations.

Here, the investment in real assets would be discussed. It is mentioned earlier that real assets have cash flows associated with them. These cash flows would be discounted to the present and calculate the NPV of the project. If, the $NPV > 0$, it will benefit the organization. If the company invest in the project with positive NPV it will bring value to the company and result in maximization of shareholders' wealth.

As we studied in previous lectures how we could estimate the after tax cash flows. The Importance of good Cash Flow forecasts and accurate Proforma Cash Flow Statement

Net After-tax Cash Flows = Net Operating Income + Depreciation + Tax Savings from Depreciation + Net Working Capital + Other Cash Flows

Other Cash Flows: Include Opportunity Costs and Externalities but Exclude Sunken Costs

In capital rationing the most important criterion, which we are using to decide whether to invest in a project is not the NPV. The second important criterion, which would be used, is the IRR. There is a new criterion which we look at in capital rationing is percent budget utilization. In other words, what percentage of the total money available to invest are you mobilizing? It is important to mobilize as much money as possible in the projects on which IRR is greater than risk free rate of return because you want to maximize the return on your portfolio.

We have study about certain special situations, which cause complexities in calculating IRR using NPV equation. Multiple IRR arises when there is more than one sign changes in cash flow diagram. In such situations, avoid using NPV equation to calculate the IRR because it would not provide the correct result. To get the correct answer we should use Modified IRR. In this, you separate the Incoming and Outgoing Cash Flows at each period in time. Discount all the outflows to the present and compound all the Inflows to the termination date. Assume reinvestment at a Cost of Capital or Discount Factor (or Required Return) such as the risk free interest rate.

MIRR is that discount rate which equates the future value of cash inflows to the present value of cash out flows. We use Common Life or EAA Approach to adjust NPV of projects with different lives.

Now, we discuss the capital rationing and see that how the context of problem changes with budget constraint.

Until now, we are discussing about the ideal case with no budget constraint. Practically, money is in short supply & it is only that much money that a company has to spend in different projects. Therefore, we need to change our analysis in order to take into account the limited resources like money in making the investment decisions.

Now, first thing to know who is responsible for the decisions relating to capital budgeting and capital rationing. Generally, the investment decision making is divided in accordance with the size of the investment and criticality of the investments.

Mandatory (Critical & Necessary for Business and Legal): CEO

Discretionary (R&D, Growth Projects) Investments: Junior Mgmt or division heads

Reasons for Capital Rationing:

What are the reasons because of which you do not invest in a project which provide you highest return? There are situations in which after calculating the IRR's and NPV's of different projects you are forced not to invest in the best project. Some reasons are

1. The best project may have a very high initial investment and you may not have that money. So, you are forced to reject that project as an option.
2. The company does not have the human resource, knowledge, or talent, which is required to undertake the project. The project might have high NPV but if you cannot manage it, you are forced not to invest in that project.
3. The companies have the prevailing fear of debt. In case of Muslim countries, there is a major issue of “Riba” (interest) among Muslim investors and the companies due to this religious constraint choose not to borrow money. That is the reason that in many Muslim countries capital rationing has an ethical bases attach to it. Usually, the investors in these countries invest in the equity based investments as it has a risk of profit or loss in that kind of investment. We will discuss this topic in the upcoming lectures.

Now, it is important from you to remember that companies have different constraints, which keep them from investing in the best projects. The fear of debt is justified because when we discuss about the risk in upcoming lectures you find out that when a company takes on debt its future cash flows become more risky. Therefore, there is a possibility of default due to which there is a fear of debt. These are various reasons due to which company decides not to invest in the project with the highest NPV and some of them involve capital rationing decisions as the following example shows.

Example:

There are 4 Projects (mutually exclusive real asset projects) to choose from. Total budget is Rs.1, 000

Project	Io=Investment (Rs)	IRR	NPV(Rs)
A:	200	40%	300
B:	100	40%	300
C:	300	35%	200
D:	800	30%	600

Which 3 projects you will choose from the above 4 real asset projects?

We cannot pick all 4 Projects because the Budget Constraint is 1000 and the total investment in all 3 Projects is 1400 (=200+100+300+800).we have to go through capital rationing process & choose from among these 4 different projects. We have some options, which are as follows.

Option 1:

If we pick Projects A, B, & C then we have to consider what will be the combined NPV of these projects and what average IRR will be of this portfolio or combination of projects. Finally, we have to look an interesting parameter for capital rationing which is what percentage of total budget available is being utilized if we invest in these projects.

Budget Utilization = $200+100+300 = 600$ (out of 1000)

Total NPV of three projects = $300+300+200 = 800$

Simple Average IRR = $38\% = (40+40+35)/3$ Non-weighted

38% seems to be attractive IRR. NPV of 800 looks good relatively to the size of investments. Finally, we look at percent budget utilization and for this option

Budget Utilization = $200+100+300 = 600$

This option is utilizing 60% of total budget.

Now we repeat the same practice for the other options available to us

Option 2: Pick Projects A and D because they have the highest NPV's.

Budget Utilization = $200+800 = 1000$

Total NPV = $300+600 = 900$

Average IRR = 35%

Option 3: Pick Projects B and D because they have the highest NPV's.

Budget Utilization = $100+800 = 900$

Total NPV = $300+600 = 900$

Average IRR = 35%

Conclusion

Summary:

Budget Utilization	NPV	Avg IRR
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Option 1	Rs.600 (60%)	Rs.800	38%
Option 2	Rs.1000 (100%)	Rs.900	35%
Option 3	Rs.900 (90%)	Rs.900	35%

It is clear from the summary that option 2 is best option. It carries the highest NPV which is Rs 900 and it also has the highest budget utilization at IRR of roughly 35 %.

Why we not choose option 1:

Option no 1 has the highest IRR of 38% but the problem is that in option 1 our NPV is not the highest, rather, it is lower than the option 2 and 3.

Secondly, Budget utilization is only 60% and the 40% of the money available for investment is wasted and is lying idle. What will you do with this money? 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 percent. So, the percent of budget utilize by any portfolio is very important as it should be as close to 100 % as possible. Thus, we conclude on the basis of maximum NPV and maximum budget utilization criterion that option 2nd is the best.

3 Types of Problems in Capital Rationing:

1. Size Difference of cash flows
2. Timing Difference of cash flows
3. Different (or Unequal) Lives of different projects:

We have discussed the problem of different lives of the projects in previous lectures.

Size Difference (in Investment Outlay):

The differences in initial investment (or outlay) means different extend of budget utilization. We compare the projects one with small cash flows taking place at regular interval and the other project has large cash flows taking place at different point in time. If two projects have different cash flows, where do you invest the un-utilized money or leftover portion of the budget? Money that is not generating a good return is being wasted and eaten up by Inflation!

Example: Budget Size is Rs 1,500

Two projects are

Project A

Cash Flows: $I_0 = \text{Rs}200$, $Yr\ 1 = + \text{Rs}300$

- NPV = Rs 73 (at $i=10\%$) IRR = 50%

Project B

Cash Flows: $I_0 = \text{Rs}1,500$, $Yr\ 1 = + \text{Rs}1,900$

- NPV = Rs 227 (at $i=10\%$) IRR = 27%

If we compare two projects the project A has higher IRR but we do not make our decision on IRR because as it is mentioned earlier that the most important criterion would be NPV.

Project B has a highest NPV. Therefore, we choose Project B. IRR is lower because you are receiving the large cash flow at the later point in time in comparison to the project A.

Timing Difference Problems:

A good project might suffer from a lower IRR even though its NPV is higher. It receives its larger cash flows later in time.

Example: Budget = Rs 2,500

Project A Cash Flows: $I_0 = -\text{Rs}1,000$, $Yr1 = +\text{Rs}100$, $Yr2 = +\text{Rs}200$, $Yr3 = +\text{Rs}2,000$ (late large cash flow)

NPV = + Rs 758 (at $i=10\%$) IRR = 35%

Project B Cash Flows: $I_0 = -\text{Rs}1,000$, $Yr1 = +650$, $Yr2 = \text{Rs}650$, $Yr3 = \text{Rs}650$ (Annuity)

NPV = + Rs 616 (at $i=10\%$) IRR = 43%

We would choose Project A on the basis NPV Criteria.

Different Lives Problem:

In comparing two projects or Assets (i.e. Sewing Machines or Printing Machines) with different lives:

Disadvantage of project with very long life:

Does not give you the opportunity (or option) to replace the equipment quickly in order to keep pace with technology, better quality, and lower costs

Disadvantage of project with very short life:

Your money will have to be reinvested in some other project with an uncertain NPV and return so it is risky. If a good project is not available, the money will earn only a minimal return at the risk free interest rate.

You should use Common Life and EAA Techniques to quantitatively compare such Projects. You have studied this topic in detail in the previous lecture.

BONDS AND CLASSIFICATION OF BONDS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic

- **Bonds**
- **Classifications of bonds**

Up to lecture no 12, we have discussed the investment decisions and capital budgeting as it relates to real assets and properties.

Now, we discuss about the securities.

Difference between Real Assets & Securities

Real assets are physical property such as Land, Machinery, equipments and Building etc. Where as securities basically, are legal contractual piece of paper.

Kinds of securities:

We have discussed about two types of securities.

Direct claim securities:

Stocks (Shares):

It is defined as equity paper representing ownership, shareholding. Appears on Liabilities side of Balance Sheet

Bonds:

It is a debt paper representing loan or borrowing. These are long term debt instruments.

Classification of bonds on Balance sheet:

One should be very careful regarding the classifications of bonds on the balance sheet. Because, when you are Issuing Bonds (i.e. borrowing money) then the Value of Bonds appears under Liabilities side (as Long Term Debt) of Balance Sheet. If you are Investing (or buying) Bonds of other companies then their Value appears under Assets side (as Marketable Securities) of Balance Sheet.

The Important thing to remember is that the stocks represent the ownership and bonds represent the debt. Both are the direct claim securities.

When a company or investor rising funds he have two possible options available to him.

- 1) Equity
- 2) Debt

One form of the debt is bonds. Value of Direct Claim Security is directly will be determined by the value of the underlying Real Asset. This concept explained with the help of the following example:

Textile Weaving Factory Case Study:

A Textile Weaving Factory uses thread to make cotton fabric and then sells cotton fabric to earn cash receipts. It needs Rs.1 million to make a Capital Investment in looms and machinery. It has two options he can raise money through

1. Equity, OR
2. Debt

Lets suppose that company decide to take Rs. 1 million in the form of debt It can raise money for a period of 1 year by Debt Financing by Issuing a 1 year Mortgage Bond whereby it pays the Lender (i.e. Investor or Bondholder) 15% p.a Coupon Interest Rate. You decided to divide 1 million in to 1 thousand parts and each one of these parts in the form of paper that has a face or par value of Rs 1,000. Each Bond paper worth Rs 1,000 and the total number of bonds is 1,000. Each bond paper carries the face value which is printed on it and also carries coupon interest rate. Suppose that coupon interest rate on this bond is 15% it means that this company would pay 15% of the face value to the lender. It is income for the lender (Bond holder). The Bond also has the limited life. In this case we suppose that management need money for the period of two years. The company pays the coupon rate to the bond holder for two years and also returns the principle to the lender after two years at maturity date.

The Lender's (or Bond Holder's or Investor's) money is protected because the Mortgage Bond is Backed (or Secured) by Real Property such as the land, factory building, and machinery. Upon Maturity, after 1 year, the Bond Issuer will return the Par or Face Value (or Principal Amount of Rs 1 million) to the Lender.

Now, we discuss different concepts which are common in different bonds. There are certain advantages and disadvantages of raising money either through equity or through bonds.

Why to raise money through a Debt (ie. Bond) rather than through Equity (i.e. Shares or Stocks)?

If the Company raises money using **Bonds**, then it will have to pay a fixed amount of interest (or mark-up) regularly for a limited amount of time. You do not share the profits of the company. But there is legal risk attached to the failure to pay interest can force company to close down.

If the Company raises money using **Equity**, then it is forced to bring in new shareholders who can interfere in the management and will get a share of the net profits (or dividends) for as long as the company is in operation! The amount of dividends can vary.

Value of the Bond:

The Value of the Bond can be calculated from the Cash Flows attached to the Bond. Bonds are direct claim securities. The bond holder will receive the coupon interest rate and he will also receive his principle amount at the time of maturity. Where do these cash flows come from? How the company is able to pay interest to the bond holder. The company is making cash from operations. Those Cash Flows depend on the Cash Flows from the Real Business i.e. the textile factory's cash flows from sale of fabric. Bond value is coming from the fabric sale. This is why the Bond is called a Direct Claim Security whose value depends on the value of some underlying real asset.

Characteristics of bonds:

In Pakistan, the bonds take on the form of Term Finance Certificates (TFC's). These are traded on three stock exchanges of Pakistan. It is quite common to trade bonds in the stock markets. In Pakistan, the Par Value (or Face Value) of each TFC is generally Rs 1,000 but it can be different. The Life of a Bond is generally limited (or finite) i.e. 6 months, 1 year, 3 years, 5 years..... The bonds can be issued by any one (Public, Private) who is in need of money. Even individuals can issue bonds. For example, Defense saving certificates, Treasury bills, T Bills (short term bonds) & FIB (Long term bonds) are also classified as the bonds.

Face value is the amount which is mentioned on the bond paper. Par value is fixed but the bonds are traded in the markets. As the financial health (cash flows and income) of the company changes with time, the Market Value (or Price) of the Bond changes (even though its Par Value is fixed). Market Prices also change depending on the Supply-Demand for the Bond (or TFC) and Investors' Perception. Major reason is the change in interest rate effect the bond price we will discuss it in detail in upcoming lectures. In case of Textile Company this company issued a bond at the fixed coupon interest rate is 15 % of par value. This rate is fixed and should be paid by the company. Non payment of this would default and result in the closing of the company.

However, the market interest rate keeps moving and it changes on daily basis. We have discussed the factors that caused the changes in interest rate in the previous lectures.

Bonds: Definition

Bond is a type of Direct Claim Security (a legal contractual paper) whose value is secured by Real Assets owned by the Issuer. Bond is issued by the Issuer (or Borrower) to the Bondholder (or Lender or Investor or Financier) in exchange for the cash. Borrowers and lenders can be individual persons or companies or governments.

Examples: Term Finance Certificate (TFC issued by Public Listed Industrial Companies), Defense Saving Certificate (DSC issued by Government), T-Bill (issued by Government) Bond is a Legal Contractual Paper Certificate that represents Long Term Debt (or Long-term Promissory Note). Bond paper contains legal & numerical points

Bonds: Numerical Features

- **Maturity or Tenure or Life:** Measured in years. On the Maturity Date when the bond expires, the Issuer returns all the money (Principal/par and Interest/coupon) to the Investor (thereby terminating or Redeeming the bond) i.e. 6 months, 1 year, 3 years, 5 years, 10 years, ...
- **Par Value or Face Value:** Principal Amount (generally printed on the bond paper) returned at maturity i.e. Rs 1,000 or Rs. 10,000. Contrast this to Market Value (or Actual Price based on Supply/Demand) and Intrinsic or Fair Value (estimated using Bond Pricing or Present Value Formula)
- **Coupon Interest Rate:** percentage of Par Value paid out as interest irrespective of changes in Market Value i.e. 5 % pa, 10 % pa, 15% pa, ... etc. Coupon Receipt = Coupon Rate x Par Value. Coupon Receipts can be paid out monthly, quarterly, six-monthly, annually...etc. Contrast to Market Interest Rate (macro-economic).

Bonds: Characteristics & Legal Points

Indenture”: Long Legal Agreement between the Issuer (or Borrower) and the Bond Trustee (generally a bank or financial institution that acts as the representative for all Bondholders). Basically protects Bondholders from mis-management by the bond issuer, default, other security holders, etc.

Claims on Assets & Income:

Bondholders have the First Claim on Assets in case the company closes down (Before Shareholders). The Financial Charges due to Bond Holders must be paid out from the Income before any Net Income can be distributed to Stockholders in the form of Dividends (see P/L Statement). If Issuer (or Borrower) does not pay the interest to the Bondholder (i.e. Default), then the firm can be legally declared Insolvent, Bankrupt, and forced to close down.

Security:

Mortgage Bonds are backed by real property (ie. Land, building, machinery, inventory) whose value is generally higher than that of the value of the bonds issued. Debentures and Subordinated Bonds are not secured by real property but they are backed by personal and corporate guarantees and their security and value is tied to the anticipated future cash in-flows of the business.

Call Provision:

The right (or option) of the Issuer to call back (redeem) or retire the bond by paying-off the Bondholders before the Maturity Date. When market interest rates drop, Issuers (or Borrowers) often call back the old bonds and issue new ones at lower interest rates.

Bond Ratings & Risk

Bonds are rated by various Rating Agencies:

Internationally: Moody's, S&P.

In Pakistan: Pacra, VIS.

Based on future **Risk Potential** of the company that is the Issuer of the bond.

Bond risk increases with:

Operating losses (check Cash Flow Statement and P/L)

Excessive borrowings or debt (check Balance Sheet)

Large variations in income

Small size of business

Country and foreign exchange rate risk

International Bond Rating Scale (starting from the best or least risky): AAA, AA, A, BBB, BB, B, CCC, CC, C, D. Also + is better and - is worse. So A+ is better than A. A- is worse than A.

Types of Bonds:

Mortgage Bonds: backed & secured by real assets

Subordinated Debt and General Credit: lower rank and claim than Mortgage Bonds.

Debentures:

These are not secured by real property, risky

Floating Rate Bond:

It is defined as a type of bond bearing a yield that may rise and fall within a specified range according to fluctuations in the market. The bond has been used in the housing bond market

Eurobonds: it issued from a foreign country

Zero Bonds & Low Coupon Bonds: no regular interest payments (+ for lender), not callable (+ for investor)

Junk Bonds & High Yield Bonds: Corporations that are small in size, or lack an established operating track record are also likely to be considered speculative grade. Junk bonds are most commonly associated with corporate issuers. They are high-risk debt with rating below BB by S&P

Convertible Bonds:

A convertible bond is a bond which can be converted into the company's common stock. You can exercise the convertible bond and exchange the bond into a predetermined amount of shares in the company. The conversion ratio can vary from bond to bond. You can find the terms of the convertible, such as the exact number of shares or the method of determining how many shares the bond is converted into, in the indenture. For example a conversion ratio of 40:1 means that for every bond (with Rs.1,000 par value) you hold you can exchange for 40 shares of stock. Occasionally, the indenture might have a provision that states the conversion ratio will change through the years, but this is rare. Convertibles typically offer a lower yield than a regular bond because there is the option to convert the shares into stock and collect the capital gain. But, should the company go bankrupt, convertibles are ranked the same as regular bonds so you have a better chance of getting some of your money back

BONDS' VALUATION**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic.

- **Bonds Valuation and Theory**

In the Previous lecture, we have studied about bonds and their different characteristics.

In this lecture, we would study about the Bonds valuation & bond pricing.

We use similar tools for the bond valuation which we have studied in capital budgeting.

Basic principal behind Valuation of direct claim securities:

Value of a Direct Claim Security such as a Bond derives from direct cash flows the form of Coupon Receipts and Par Recovery at maturity. The value of the bond is directly tied to the Value of the Underlying Real Assets of the Business (whose operations generate cash receipts from sales of goods and services). It means that income from the bond starts from the real assets. The coupon payments made by the company are generated from the cash flows from the real assets of the company.

Now, we would calculate the value of the bond by using Net Present Value or Present Value formula that we have studied in the capital budgeting. That is called fair or intrinsic value of the bond. We compare the fair value with the market value of that bond. Whether there is a difference between the fair value and market value of the bond.

Let's review the present value formula for the bond in detail.

The relationship between present value and net present value

$$NPV = -I_0 + PV$$

When we talk about the present value it is equal to net present value + initial investment.

We calculate the present value of the direct claim securities because it gives us intrinsic value of that direct claim security should be. It is the starting point of comparing them

Present Value formula for the bond:

$$PV = \sum_{t=1}^n CF_t / (1+r_d)^t = CF_1/(1+r_d) + CF_n/(1+r_d)^2 + \dots + CF_n / (1+r_d)^n + PAR / (1+r_d)^n$$

In this formula

PV = Intrinsic Value of Bond or Fair Price (in rupees) paid to invest in the bond. It is the Expected or Theoretical Price and NOT the actual Market Price.

r_d = it is very important term which you should understand it care fully. It is Bondholder's (or Investor's) Required Rate of Return for investing in Bond (Debt). As conservative you can choose minimum interest rate. It is derived from Macroeconomic or Market Interest Rate. Different from the Coupon Rate!

Recall Macroeconomic or Market Interest Theory: $i = iRF + g + DR + MR + LP + SR$

CF = cash flow = Coupon Receipt Value (in Rupees) = Coupon Interest Rate x Par Value. Represents cash receipts (or in-flow) for Bondholder (Investor). Often times an ANNUITY pattern. Coupon Rate derived from Macroeconomic or Market Interest Rate. The Future Cash Flows from a bond are simply the regular Coupon Receipt cash in-flows over the life of the Bond. But, at Maturity Date there are 2 Cash In-flows: (1) the Coupon Receipt and (2) the Recovered Par or Face Value (or Principal)

n = Maturity or Life of Bond (in years)

In the next lectures, you would study that how the required rate of return is related to market rate of return.

The fair value of the bond is the value that we expect the bond to be. We have to compare this value with the actual price of the bond in the market. The actual price of the bond (market value) varies on the supply and demand of the bond in the market and it will vary depending upon the interest rate in the bond.

On the basis of above comparison we decide whether to invest in a particular bond or not.

The market rate of interest prevailing in the market effects price of the bond. Because, market rate of return will have an impact on r_d which is the required rate of return expect by the investor of the bond.

When Market Interest Rate (ie. Investors' Required Rate of Return) Increases, the Value (or Price) of Bond Decreases. Check using formula. This is known as Interest Rate Risk. This is a

simple relationship because rD which will rise and fall with the general interest rate is in the denominator of the equation. So, when interest rate in denominator goes up the present value (price) will decrease.

When Market Interest Rate have went behind the coupon interest rate. As the coupon interest rate has been fixed by the bond issuer. The issuer have to pay that rate but the market rate fluctuates on daily and hourly basis.

So, When Market Interest Rate < Coupon Interest Rate, Market Value (or Price) of Bond > Par Value. Because when market is offering lower rate of return then the bond then the bond becomes valuable. This is known as a Premium Bond. If Required Rate = Coupon Rate then Market Value = Par Value. Check using formula. As Maturity Date approaches, Market Value of Bond will approach its Par Value. Note: Market Rate varies but Coupon Rate is fixed.

Bonds have the limited life and as the life of a bond expires the bond approaches its maturity date the market value of the bond approaches to par value of the bond.

Long Bond - Risk Theory:

Interest Rate Risk for Long Term Bonds (i.e. 10 year bonds) is more than the Interest Rate Risk for Short Term Bonds (i.e. 1 year bonds) provided the coupon rate for the bonds is similar. When investor buy a long term bond he is locked in investment for long term period there are more chances of fluctuation in interest rate and the inflation rate.

So, the impact of interest rate changes on Long Term bonds is greater. Long Term Bond Prices fluctuate more because their Coupon Rates are fixed (or locked) for a long time even though Market Interest Rates are fluctuating daily; therefore the price of Long Bonds has to constantly keep adjusting.

Price of the long term bond fluctuates more as compared to the short term bond. Because, you have a long term bond with fix coupon rate but the market interest rate is fluctuating in between the years

Bond Portfolio Theory:

Changes in Market / Macro Interest Rates have 2 Major Impacts on the Portfolio (collection of bond investments) of the Bondholder:

(1) **Interest Rate Risk:** In this, the value of Bond Portfolio Drops if interest rates Rise) and

(2) **Reinvestment Risk:** In this, the overall Rate of Return (or Yield) on the Bond Portfolio Rises when interest rates rise the opportunity cost for the bond holder has changed. For example, somebody may have bought a short term bond with coupon rate of 15 % for one year. At maturity there is a risk that bondholder may not find another investment that can yield as much as 15%. When old bonds mature, bondholders are forced to invest in bonds at lower coupon rates). It is higher for short term bonds.

Interest Rate Tradeoff:

The 2 Effects Cancel Each Other Out. When market Interest Rates Rise, Bond Prices Drop (Interest Rate Risk Goes Up) BUT Overall Returns on future reinvestment in bonds go up (ie. Reinvestment Risk Goes Down).

Bond Maturity (Life) Tradeoff:

SHORT-life bonds (ie. 1 year) have less Interest Rate Risk than long Bonds (ie. 10 years) but the Short-life bonds have MORE Reinvestment Rate Risk.

Bond Valuation - Café Case Study

Example:

You do not have enough money to start your business so you approach a bank. The bank offers to lend you Rs 100,000 and you sign a bond paper. The bank asks you to issue a bond in their favour on the following terms required by the bank:

Par Value = Rs 100,000 (ie. Loan Principal Amount)

Maturity = 2 years

Coupon Rate = 15% mark-up paid at end of each year

Security = Property Deed for the canteen space

Note: This is a simplified case where we are treating a short-term bank loan like a Bond. 

For the Bank, what is the Value of Investing in a Bond with you?

CF = Cash Flow = Coupon Value

= Coupon Rate x Par Value

= 15% x Rs 100,000 = Rs15,000 pa.

The bank will receive Rs 15,000 in interest every year for two years from you because you have agreed to pay 15% mark-up.

Assume the Bank's Required Return (r_D) = 10% pa. The bank's opportunity cost is 10% because it can earn this much by investing risk free in T-bills

Now compute the PV or Fair Price of Bond:

$$- \text{PV} = 15,000 / 1.1 + 15,000 / (1.1)^2 + 100,000 / (1.1)^2 = 13,636 + 12,397 + 82,645 = +\text{Rs. } 108,678 \quad (= \text{PV and NOT NPV!})$$

So, what is the Value of this Financing Deal to the Bank? Lending (ie. negative Rs 100,000) to you today at 15% mark-up for 2 years is worth positive Rs 108,678 to the bank today, i.e. A net gain in value for the bank. BUT, if some other bank offers to pay Rs 110,000 to this bank to buy this deal from them, then this bank should sell!

BONDS VALUATION AND YIELD ON BONDS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Bond Valuation**
- **Yield of Bonds**

In previous lecture, we studied are bonds are long term debt instruments. Like Stock bonds are also **direct claim securities** which means that the value of these bonds is determined by the future cash flows that bond holders will receive. These cash flows are of two basic types

1. Cash inflow: in the form of coupon receipt with regular interval over the life of the bond
2. Other cash flow is the par value of the bond which you will receive at the maturity date of the bond.

Present Value formula for the bond:

$$PV = \sum_{t=1}^n \frac{Cft}{(1+r_D)^t} = \frac{CF_1}{(1+r_D)} + \frac{CF_n}{(1+r_D)^2} + \dots + \frac{CF_n}{(1+r_D)^n} + \frac{PAR}{(1+r_D)^n}$$

NPV = Intrinsic Value of Bond or Fair Price (in rupees) paid to invest in the bond. It is the Expected or Theoretical Value and needs to be compared to the Market Price. It is different from the Par (or Face) Value which is printed on the Bond paper.

r_D = Bondholder's (or Investor's) Required Rate of Return for investing in Bond (Debt). DIFFERENT from the Coupon Rate and the Market / Macroeconomic Interest Rate!

There are basically 2 kinds of Cash Flows:

- (1) Annuity from Fixed Regular Coupon Receipts ($CF = \text{Coupon Rate} \times \text{Par Value}$) and
- (2) Single Cash Flow from Par Value (or Initial Investment) Returned to the Investor on maturity.

In this equation

r_D : It represents the required rate of return. It is the return which is required by the investor based on his opportunity cost. In case of Pakistan, the investor required a higher return on bond then the rate of markup offered by the PLS account in bank. It is different from the Coupon Rate and the Market / Macroeconomic Interest Rate.

Coupon or CF:

It is a fixed rate and it is equal to

$$(CF = \text{Coupon Rate} \times \text{Par Value})$$

Par value of the bond is fixed but the market price varies with the change in the supply and demand, perception of investor for that bond.

Example:

Defense Savings Certificates: Suppose that you invest in a Defense Savings Certificate whose Par Value is Rs 100,000. The Bond Issuer is the Government of Pakistan. The Certificate has small detachable coupons. You (as the Bondholder or Investor) can present one Coupon at the end of every month and receive Rs 1,000 cash. After 1 year, you will be repaid your Principal Investment (or Par Value) of Rs 100,000. Assume your Required Return (r_D) is 10% pa. What is the Present Value of this Investment to you?

In the previous lectures, we have solved simple version of similar example we solved a problem similar to this where we had to calculate the NPV of the Defense Savings Certificate with 1 Annual Coupon payment after 1 year.

We arrived at the following approximate answer:

$$\begin{aligned} NPV &= -I_0 + \frac{CF_1}{(1+i)} + \frac{CF_{11}}{(1+i)} \\ &= -100,000 + \frac{12,000}{(1+0.10)} + \frac{100,000}{(1+0.10)} \\ &= -100,000 + 10,909 + 90,909 \\ &= 1,818 \end{aligned}$$

(NOTE: $PV = NPV + I_0 = 10,909 + 90,909 = 101,818$)

But this is not the correct exact answer to our present example because it ignores monthly compounding.

Accurate Solution - Monthly Compounding:

The Accurate solution to the Savings Certificate Example with Monthly Coupons requires us to use a monthly cash flow diagram and do monthly discounting. There is an Annuity Stream of 12

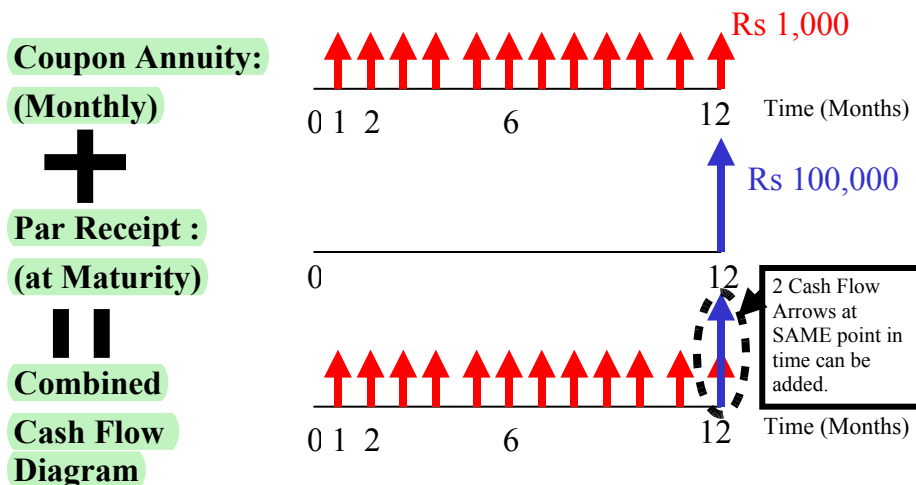
Coupons (Cash Inflows) of Rs 1,000 each at the end of every month. There is a final Cash Inflow worth the Par Value of Rs 100,000 at the end of the 12th month.

The Cash Flow Diagram for Bonds is a Combination of 2 Flows: (1) an Annuity Stream (of Coupon Receipts) every month for 12 months and (2) One Par Receipt at the end of the 12th month. You can draw their individual Cash Flow Diagrams and then add them up later. You can compute their PV's separately and then add them up later.

Cash flows from coupons represents by the upward pointing arrows which represents cash inflows.

In combine diagram, at the end of the year there are two upward pointing arrows. One for coupon rate and the other is for the payment of par value of bond.

Bond Cash Flow Diagram Savings Certificate Example



Calculate the PV of Coupons from the FV Formula for Annuities (with multiple compounding within 1 year):

$$FV = CCF (1 + rD/m)^{n \times m} - 1/rD/m$$

Use Monthly Basis for this example. $n = 1$ year $m = 12$ months

CCF = Constant Cash Flow = Rs 1,000 = Monthly Coupon

rD = Annual Nominal Required Rate of Return for investment in Bond (Debt) = 10% pa.

Periodic Monthly Required Rate of Return is $rD/m = 10/12 = 0.833\% = 0.00833$ p.m.
 $m = 12$ months

Coupon Annuity Cash Flow Receipts

$$FV = 1,000 \times [(1.00833)^{12} - 1] / 0.00833 = +Rs 12,566 \text{ (at the end of 1 year)}$$

$$PV (\text{Coupons Annuity}) = FV / (1 + rD/m)^{n \times m} \\ = 12,566 / (1.00833)^{12} = +Rs 11,374$$

Final Par Value Cash Flow Receipt

$$FV = 100,000 \text{ (at the end of 1 year)}$$

$$PV (\text{Par}) = 100,000 / (1.00833)^{12} = +Rs 90,522$$

$$PV = PV (\text{Coupons Annuity}) + PV (\text{Par}) = 11,374 + 90,522 \\ = +Rs 101,896 \text{ (Final Answer)}$$

So this Certificate is worth Rs 101,896 to you today. It is worth more than the Market Price (Rs 100,000). So it is a good investment.

NOTE: Our answer is slightly higher than what we got when we used Annual compounding (Rs 101,818). when we consider multiple compounding the present value of the bond increases. Its NPV is greater than zero so on the basis of our capital budgeting techniques you should invest in that project. Now, we consider over all rate of return on a bond. We have studied expected price of the bond. These two are complimentary. When bonds trader talk about he overall return on a particular bond they referred to yield to maturity.

Bond Yield to Maturity (YTM):

We can calculate the Value of our Investment in Bonds. But how can we compute its Rate of Return? Both are important whether you are talking about Investment in Real Assets or Securities.

The most common way to compare the Overall Rate of Return of different Bonds is to compare their **YTM's**.

In capital budgeting, you can calculate IRR using the NPV equation. Similarly, you can calculate it by setting the PV Equation for Bond Valuation equal to the Present Market Price and solve for “rD”. Use Trial and Error or Iteration. The value of “rD” that gives PV = Market Price is the YTM for that Bond.

$$PV = \text{Bond Market Price} = \frac{CF_t}{(1+rD)^t} + \frac{CF_1}{(1+rD)} + \frac{CF_2}{(1+rD)^2} + \dots + \frac{CF_n}{(1+rD)^n} + \frac{PAR}{(1+rD)^n}$$

All variables are known (ie. CF, PAR, and n) EXCEPT rD. Set PV equal to the Actual Present Market Price of Bond and solve for rD

$$YTM = rD$$

Bond YTM – Example:

Term Finance Certificate (TFC): The TFC (a kind of Bond) of Company ABC is traded in the Karachi Stock Exchange for Rs 900. The Par Value of the TFC is Rs 1,000. The Coupon Rate is fixed at 15% pa. Coupons are paid annually. The TFC will Mature after exactly 2 Years (it is a 5 Year Bond issued 3 Years ago). What is the Overall Expected Rate of Return (ie. YTM) offered by this TFC? Market Price (Rs 900) is LESS than its Par Value (Rs 1,000). This Bond is selling at a Discount. Why? Possibly Interest Rate Risk. Market Interest Rate rises above TFC's Fixed Coupon Rate so Market Price of the TFC falls below Par. Note: when Market Interest Rates rise, Required Rate of Return (rD) for Investors rises. But, Coupon Rate fixed by Bond Issuer at time of issue.

The Expected (or Promised) Rate of Return for Investors is the Yield to Maturity (or YTM). Compute the Overall Return (or YTM) for the TFC using the Old IRR-like Approach:

PV = Market Price = Rs 900

Par Value = Rs 1,000. Receive this after 2 Years (remaining life)

Annual Coupons = Coupon Rate x Par = 15% x 1,000 = Rs 150

rD = Minimum Return Required by the Investors investing in
The Bond Market = YTM.

This is unknown in the equation.

$$PV = 900 = 150 / (1+rD) + 150 / (1+rD)^2 + 1,000 / (1+rD)^2$$

$$900 = 150 / (1+rD) + 1,150 / (1+rD)^2 \text{ . Use Trial \& Error}$$

$$rD > 15\%: \quad \text{Try } rD = 20\%: PV = 924 \text{ (close)}$$

$$\text{Try } rD = 21\%: PV = 909 \text{ (closer)}$$

$$YTM = 21.7\%: \text{ (Gives } PV = \text{Rs } 900)$$

YTM: YTM is the expected rate of return for which the bond holder holds the bond until maturity but if the bond holder before maturity is called by the issuer or if the holder of the bond decides to sell the bond before maturity then your answer will change. All the calculation will remain the same only par value is replaced as n

$$PV = \sum_{t=1}^n \frac{CF_t}{(1+rD)^t} = \frac{CF_1}{(1+rD)} + \frac{CF_2}{(1+rD)^2} + \dots + \frac{CF_n}{(1+rD)^n} + \frac{CALL}{(1+rD)^n}$$

Where CALL = PAR Value + 1 Year's Worth of Coupon Receipts

$$YTM = \text{Total or Overall Yield} = \text{Interest Yield} + \text{Capital Gains Yield}$$

$$\text{TFC Example Total Yield} = YTM = +21.7\%$$

$$\text{Interest Yield or Current Yield} = \text{Coupon} / \text{Market Price}$$

$$\text{TFC Example Interest Yield} = \text{Rs } 150 / \text{Rs } 900 = +16.7\% \text{ pa}$$

$$\text{Capital Gains Yield} = YTM - \text{Interest Yield}$$

$$\text{TFC Example Capital Gains Yield} = 21.7\% - 16.7\% = +5\%$$

n = Maturity or Life of Bond (in years)

$$FV = CCF[(1+r_D/m)^{n*m} - 1] / r_D/m$$

N=1 year, m= no. of intervals in a year = 12

CCF=constant cash flow = 1000=monthly coupon. we can plug the values in this formula to know what the future value of annuity is going to be? take a look at the coupon annuity:

$FV=1000[(1-0.00833)^{12}-1]/0.00833=+12566$ at the end of one year what is the present value of this coupon annuity

$$PV=FV/(1+r_D/m)^{n*m}$$

$$=12566(1.00833)^{12}$$

$$=+11374$$

This is the present value of cash flow from coupon. Now we need to calculate the present value of face value at maturity suppose face value =100,000 then

$$PV(PAR)=100,000/(1.00833)^{12}$$

$$=+90,522$$

Now, we combine the present value of coupon interest and present value of par both i.e.=11374+90522= Rs.101896.

When we compare the answer with annual cash flows where coupon was not compounded monthly .it is grater because monthly compounding increase future cash flows as well as the present value .2nd thing is that this NPV is grater than the initial investment which is Rs.100,000so, we should under take this project because the NPV is grater .now, the next area is the rate of return so, the important thing in this regard is yield to maturity .this is abbreviated as YTM.it is easy to understand because we have discussed IRR in capital budgeting .where we set NPV=0 and calculated for r .here market price is the YTM of the bond and then solving for the variable r_D =required rate of return .so, let's try to understand YTM using a very simple example ,the example that we will pick out is that of term finance certificate or TFC which is by the stock exchanges of Pakistan for Rs.900.let's assume that its par value is Rs.1000fixed or coupon interest rate is 15 p.a. and it is paid annually ,total life of the TFC is 5 years 3 years have already passed and it will mature 2 years from now what will be over all expected rate of return .So, let's see the equation if we compute the over all yield here we can equate PV=market value is the YTM for the bond the PV=900 which is market price PAR=1000.

$$\text{Annual coupon rate} = \text{coupon rate} * \text{par} = 15/100 * 1000 = 150$$

r_D =minimum return required by the investor in the bond market =YTM it is unknown ?

$$PV=900=150/(1+r_D) + 150/(1+r_D)^2 + 1000/(1+r_D)^2$$

we also know that the value of r_D should be more than 15% you will try different values for example if you try 20% you will come up with PV=24 (close),try $r_D=21.7\%$ PV=900 so,

$$YTM = 21.7\% = 900$$

Therefore 21.7% is the yield to maturity for this TFC because $r_D=YTM$.YTM is the expected rate of return for which the bond holder holds the bond until maturity but if the bond holder before maturity is called by the issuer or if the holder of the bond decides to sell the bond before maturity then your answer will change .all the calculation will remain the same only par value is replaced as call value so,

Call=par value +I, year coupon receipts

Another thing to keep in mind is that YTM has two components first is 

YTM=interest yield on bond +capital gain yield on bond from his example

YTM= 21.7% so,let's calculate the interest yield

INTEREST YIELD =annual coupon interest /market price

$$=150/900 =16.7\% \text{ so,}$$

$$CAPITAL YIELD =YTM -INTEREST YIELD$$

$$=21.7\%-16.7\%=5\%$$

INTRODUCTION TO STOCKS AND STOCK VALUATION**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Introduction to Stocks**
- **Stock Valuation**

In previous lectures, we have discussed about one kind of direct claim security which is bonds. Bonds are long term debt instruments. Now, we will take in detail about another kind of security which is known as Stocks or Shares.

Stocks:

These are equity paper representing ownership. Shareholders are part owners of the company. If you look at the balance sheet when the company issues shares to raise money such shares should be shown on the liability side of the balance sheet of the company. Shareholders are called owners of the company these are shown under the equity section. However, the shares that are purchased by the company are shown on the asset side of the company under the head of marketable securities. Generally, when we are talking about the issuance of the shares we refer to shares as liability. Basically, the share is a legal contractual piece of paper it shows the name of the company. It shows the par or face value of the share and it also assures that the shareholder is the part owner of the company.

Remember that Shares are distinguished from the bonds because shares represent the ownership whereas the bond is a debt instrument. Another thing about the shares is to remember that par value is the value when they are issued the market value of the shares changes with investor's perception about the company's future and supply and demand situation. So, do not confuse the par value with the Market value of the shares. par value is printed on that share certificate. As we have studied that Value of **Direct Claim** Security is directly tied to the value of the underlying Real Asset.

Why raise money through Equity (i.e. Shares or Stocks) rather than Debt (i.e. Bonds or Loan)?

What are the advantages of raising money through equity?

Equity financing gives the flexibility that you do not have to make regular payments. In case of debt or bond you have under taken a promise to pay a fixed rate of return. but in case of shares a fixed rate of interest is paid only dividend is paid on net income according to the decisions of the board of directors and management. You have no obligations to pay fixed dividend to common shareholders. But, if the Company raises money using Bonds, then it will have to pay a fixed amount of interest (or mark-up) regularly for 2 Years. If the Company does NOT pay on time, you are declared Defaulter and your business can be closed and the Lenders (Bondholders) can sell the company's assets to recover their money.

The value of direct claim security because derived from underlying real asset. It can be thought of as a piece of paper that generates a certain cash flow over the period of time. Share certificate is a piece of paper that represents some other real assets and it generates future cash flows.

1. Dividend you are received as shareholder.
2. Capital gain

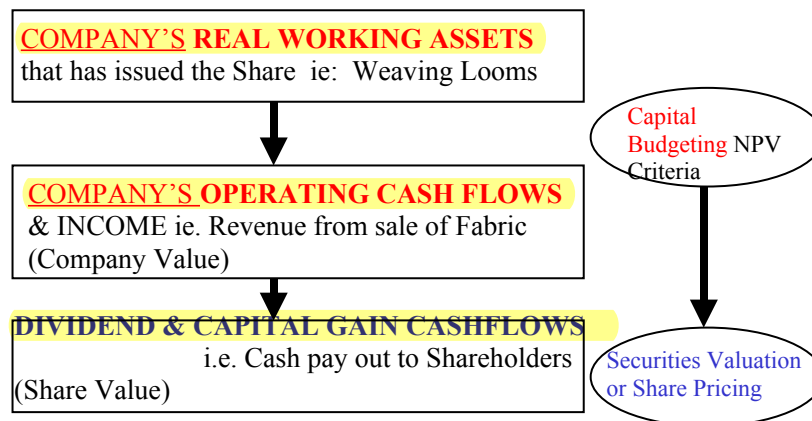
For example, if there is a textile company which need to raise the amount of Rs1 million to invest in looms. Company can raise this amount either by equity or bonds.

In case the company decides to raise it through equity. Then it issues the share certificate amounting to Rs 1 million and sells them to various interested investors and receives the capital in the form of equity.

Why do these share certificates carry value?

This investment for the share holders will generate the cash flow in form of income and the cash flows in the form of capital gains. These cash flows are generated through the underlying real assets. what are these real assets. the real assets in this example are the textile weaving looms and fabric prepared by these looms. The cash flows are generated from the sale of this fabric. From these cash flows the company is paying dividend (See diagram)

Share Value & Cash Flows from Underlying Real Assets



Share Concept:

A Limited Company can raise money by Issuing (or selling) Equity in the form of Shares. In Pakistan, the Par Value (or Face Value) of each share is generally Rs 10. But by in large public listed companies' issues shares with par value of Rs.10 each. keep in mind that par value of the share is value when it was issued when it has gone into market it has different value. The Life of a Share is considered Perpetual (or never-ending "going concern") unless of course the company closes down or goes bankrupt.

As the financial health (cash flows and income) of the company changes with time, the Market Value (or Price) of the Share changes (even though it's Par Value is fixed). Market Prices also change depending on the Supply-Demand for the share and also speculation or *satta*.

Shares of Listed Public Limited Companies are traded in the Stock Exchange like KSE (Karachi Stock Exchange), LSE (Lahore), ISE (Islamabad). You can buy / sell shares over the phone &/or computer through your Broker whose agents / Jobbers are trading at the exchange. You make payments to your Broker through a Brokerage Account at one of the banks in the Stock Exchange or through cash soon after the trade is made.

Shares of Private Limited Companies (which are not listed) can also be bought and sold privately and the Corporate Law Authority and Registrar Joint Stock Companies need to be informed.

Types of Equity:

There are two types of equity

1. **Common Stock**
2. **Preferred Stock**

Common Stock:

It is the most common kind of equity as compared to preferred stock. Common Shareholders are Owners who have Voting Rights in management decisions. Common Shareholders are owners who receive a Dividend (share of the Profit or Net Income proportionate to their shareholding) which varies depending on the Net Income for that year and the decision of the Board of Directors regarding how much to Retain and Reinvest. Cash flows associated with common shares will be used to calculate the expected price of share then we compare it market value of stock. There are 2 kinds of cash flow associated with the stocks

1. Dividend you received as shareholder: In case of common stocks, these are unpredictable and changing as to bond valuation where the coupon receipts are generally constant and regular in time interval. Therefore we can use annuity formula. But when we are talking about common shares dividends are not fixed. That's make the valuation of common stock different from bond valuation
2. Capital gains

Preferred Stock:

This kind of Equity is rare. Preferred Shareholders get a preference (or priority) over the Common Shareholders in recovering their money if the company goes bankrupt. Although Preferred Shareholders are owners, they may not get voting rights. It is also known as Hybrid

Equity. As it is a Mix of Bond and Share. Preferred Shareholders receive a Fixed Regular Dividend (similar to the Coupon for a Bondholder).

Share Price Valuation - Preferred Stock:

Perpetual Investment with Fixed Regular Dividends:

Perpetual Investment means you are considering buying this Stock and keeping it forever!

$$PV = P_0^* = \text{DIV } 1 / r_{PE}$$

Where r_{PE} = Minimum Required Rate of Return on Preferred Stock Equity for the individual investor, PV = Present Market Value (or Estimated Present Price) which depends on $\text{DIV } 1$ = Forecasted Future Dividend in the next period (ie. Year 1 and all other years since $\text{DIV } 1 = \text{DIV } 2 = \text{DIV } 3 = \dots$) Basically, it is a Perpetuity Formula.

Finite Investment:

Finite Investment means you plan to buy this Stock and then sell it in a few days or years (n). Formula similar to Bond.

$$PV = P_0^* = \text{DIV } t / (1 + r_{PE})^t + P_n / (1 + r_{PE})^n$$

t = year. Sum from $t = 1$ to n . P_n = Final Expected Selling Price

PV (Share Price) = Dividend Value + Capital Gain / Loss.

The Dividend Value derived from Dividend Cash Stream and Capital Gain / Loss from Difference between Buying & Selling Price.

Example:

Company ABC Preferred Stock is traded in the Lahore Stock Exchange and has a Market Price of Rs 13. The Company has fixed the Dividend to be Rs 2 per share. The Par Value of each share is Rs 10. You expect the Price to be Rs 13 after 2 years. As the investor, you expect a Minimum Required Return of 10% because you can earn that much from a bank deposit account almost risk free. BUT, Stocks are generally more risky investments than bank deposits SO you will only invest in risky stock IF the expected return is higher than 10% - lets say 15%. Calculate the Fair (or Expected) Price of the Preferred Stock.

NOTE: We will discuss RISK in detail later in course

Perpetual Investment in Preferred Stock

$$PV = \text{DIV } 1 / r_{PE} = \text{Rs } 2 / 15\% = 2 / 0.15 = \text{Rs } 13.33$$

The Fair (or Intrinsic Value) of the Share to You is Rs 13.33. The Market Value is Rs 13. So, the Share is worth more to You than its price in the market. It is undervalued and you will gain value by buying it.

Finite Investment in Preferred Stock:

$$PV = \text{DIV } t / (1 + r_{PE})^t + P_n / (1 + r_{PE})^n \quad n = 2 \text{ years}$$

$$= 2 / (1.15) + 2 / (1.15)^2 + 13 / (1.15)^2 = \text{Rs } 13.08$$

In this example, Perpetual Investment in Preferred Stock is worth more than Finite Investment in Preferred Stock because Present Value of the Infinite Stream of Rs 2 Dividends is more than the Present Value of the expected future Selling Price (Rs 13).

Share Price Valuation - Common Stock

Finite (Limited Life) Investment in Common Stock

It is more common. Need to account for Cash Flows from Variable Dividends and Estimated Selling Price (P_n).

Note that P_n depends on $\text{DIV } n+1$. Price at any point in time will always depend on Dividend in the following year! Formula is similar to Bond Valuation Equation.

Perpetual Investment in Common Stock:

$$PV = \text{DIV } 1 / (1 + r_{CE}) + \text{DIV } 2 / (1 + r_{CE})^2 + \dots + \text{DIV } n / (1 + r_{CE})^n + P_n / (1 + r_{CE})^n$$

$PV = P_0^*$ = Expected or Fair Price = Present Value of Share, $\text{DIV } 1$ = Forecasted Future Dividend at end of Year 1, $\text{DIV } 2$ = Expected Future Dividend at end of Year 2, ..., P_n = Expected Future Selling Price, r_{CE} = Minimum Required Rate of Return for Investment in the Common Stock for you (the investor). Note that Dividends are uncertain and $n = \text{infinity}$

PV (Share Price) = Dividend Value + Capital Gain.

Dividend Value is derived from Dividend Cash Stream and Capital Gain / Loss from Difference between Buying & Selling Price.

Perpetual Investment in Common Stock:

It is an idealized Case. The Final Cash Flow term (containing P_n) in the equation takes place at Year $n = \text{infinity}$. The last term (containing P_n) has a Present Value almost equal to Zero because the **Discount Factor $(1+rE)^n$** in the denominator becomes very large when $n=\text{infinity}$. So, you can ignore the Last Cash Flow terms taking place at Year n .

Simplified Formula (P_n term removed from the equation for large investment durations i.e. $n = \text{infinity}$):

$$PV = \text{DIV}_1 / (1+rE) + \text{DIV}_2 / (1+rE)^2 + \dots \text{DIV}_n / (1+rE)^n$$

$$= \text{DIV}_t / (1+rE)^t, t = \text{year. Sum from } t=1 \text{ to } n$$

This Equation is still impractical because need to forecast Dividends for every year forever!!

Example:

The Common Stock of Company ABC is being traded in the Islamabad Stock Market. Its Market Price is Rs.13. You study Company ABC's Annual Report, Balance Sheet, Income Statement, and Cash Flow Statement and you forecast the future Dividends to be Rs 2 in the first year and Rs 4 in the second year. You forecast the Market Price to be Rs 13 after 2 years. The Par Value of each share is Rs 10. The Risk Free Return is 10% pa. Your expected Minimum Required Return from the high-risk Common Stock of ABC is **20%**. Calculate the Fair (or Expected) Price of the Common Stock

Common Stock Valuation (Risky Investment: $r_{CE} = 20\%$)

1st year will be Rs.2 and dividend in 2nd year will be Rs.4 assume risk free rate of return is 10% and high rate of return to be required is 20% again this 20% is higher than 10% in a country and this 20% minimum required rate of return is higher than the preferred stock required by that company is 15 % .this is because common stock is considered more risky than preferred stock and bank deposit in a country .let's calculate the value of common stock for company ABC we will use our old present value formula for finite investment :

$$PV = 2/1.2 + 4/(1.2)^2 + 1.3/(1.2)^2$$

$$\text{Finite Investment for 2 Years: } PV = 2/1.2 + 4 / (1.2)^2 + 13 / (1.2)^2 = \text{Rs } 13.47$$

This is estimated price for 2nd year investment based on forecasted dividend let's see the long term investment use present value formula about which we talked earlier on

Perpetual Investment: $PV = ??$

We can not determine it because we don't have Dividend forecast data for every year forever!! We need to use Models for approximating future Dividends Cash Flow Stream:

Zero Growth Model

Constant Growth Model

We will discuss about these in the next lecture.

COMMON STOCK PRICING AND DIVIDEND GROWTH MODELS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Common Stock pricing**
- **Dividend Growth Models**

In this lecture, we continue our discussion on the topic of stock price valuation.

In previous lecture, we have discussed that there are two types of Shares (or Stocks or Equity Securities)

1. Preferred Stock:

These stocks have regular Constant / Fixed Future Dividends Certain for the Preferred Shareholders. Use old Perpetuity Cash Flow Pattern and formulas to estimate theoretical Fair Stock Price.

2. Common Stock:

These stocks have variable future dividends expected by the common shareholders. Use Zero & Constant Growth Models to simplify future Dividend forecasts in estimated Theoretical Stock Price (or PV) equation. There dividend depend upon the income earned by the company and also upon the management decision regarding the dividend declaration.

Both stocks represent ownership of Real Assets in Company.

Dividends are the Shareholder's portion of the Distributed Net Income. The value of direct securities (piece of paper) derived from the cash flows generated from the underlying real assets.

There are two types of **Investment Time Horizons**

1. Finite Investment:

In this duration of our investment is limited. Cash inflow from Forecasted Selling Price must be taken into account in price estimate.

2. Perpetual Investment:

It is very long term horizon for long term investment. It is Perpetual so Forecasted Selling Price not significant and can be eliminated. If you are planning to buy and hold the share for 20 or 30 years then you can consider it as a long term assets. Similarly, an investment in the share for the period of one or two years

Value of a Share (which is a Direct Claim Security) can be estimated based on the Cash Flows that it generates. A Share generates Cash Dividends just like a Real Asset Project generates Cash Income.

The Formulas for the theoretical price valuation vary depending upon the time horizon. As in previous lectures the formula for preferred shares varies depending on whether your time horizon is finite or perpetual.

Let us compare both common shares and preferred shares with the help of numerical example.

Example:

Company ABC has issued 2 Types of Shares (both of Par Value = Rs 10) and you are considering Investing in both shares for 2 years because you think the price will rise to Rs 13 by then. The Market Risk Free Return (Opportunity cost) is 10% pa.

ABC Preferred Shares:

Dividend Fixed by the Company at Rs 2 per share per year. Your required rate of return for the risky preferred shares is 15%. This is the rate of return that you expect to get if you take risk of investing the money in preferred shares. Preferred shares are considered to be more risky than the deposit in the bank. So, our required rate of return in case of preferred stock should be higher than 10%.

ABC Common Shares:

Dividend varies. After analyzing the Company's Annual Report, Balance Sheet, Income & Cash Flow Statements, you forecast the future Dividends to be Rs 2 in the first year and Rs 4 in the second year. The required rate of return does not have to be identical to the required rate of return on preferred shares. As, there is no guaranteeing you a fixed rate of return on common shares. Your required rate of return for the more risky common shares is 20% pa. Finally, based upon the analysis of financial statements of the company you expect that the price of share will rise to Rs. 13 after 2 years. You planned to look at different investment cases you are interested in estimating what the theoretical market price of this share should be if you invest perpetually and you are also interested in the price of the share

if you invested for a short period time. So, for the case of preferred stock, we calculate the expected market price for long term investment would be.

Solution:

Preferred Stock (Risky Investment: $r_{PE} = 15\% > 10\%$ = risk free)

$$\text{Perpetual: } PV = \text{DIV}_1 / r_{PE} = 2 / 15\% = 2 / 0.15 = \text{Rs } 13.33$$

Now in case of finite investment

$$2 \text{ Year (Finite): } PV = 2 / 0.15 + 2 / (0.15)^2 + 13 / (0.15)^2 = \text{Rs } 13.08$$

Common Stock Valuation (More Risky Investment: $r_{CE} = 20\%$)

Perpetual Investment: $PV = ?$ We don't have enough Dividend forecast data in order to calculate the value for 20 or 30 years from now. We discuss the solution of this problem later in the lecture. Here $1.2 = (1 + 20\%)$. We use Rs 13 because we expect to sell these shares for Rs.13 after 2 Years.

$$2 \text{ Year (Finite): } PV = 2 / 1.2 + 4 / (1.2)^2 + 13 / (1.2)^2 = \text{Rs } 13.47$$

Interpretation:

In our example, Common Stock has higher Intrinsic Present Value or Fair Value (or Estimated Market Price) than Preferred Stock because Common Stock offers higher expected Dividends which more than compensates for the higher risk of the common stock. We discuss this in detail when we study the topic of Risk and Return.

Share Values:

Fair Value VS Market Price

Fair Value:

It is estimated from PV Equation. We calculate this from NPV equation based on a required rate of return as the discount rate or r in the equation. This is very important to understand because the ROR is our personal ROR and its value varies depending on the investor who is doing the calculation. Every person has a different Risk Profile. Therefore, Fair Value varies depending on the investor who is doing the calculation and his/her Personal Required Return.

Market Price:

It is actual price at which it is bought or sold. It is determined by Share's Demand/Supply & Investor Perceptions & Psychology about the company behind the share. Market Price is almost identical for everyone.

In **Efficient Markets** where investors have almost equal information, Fair Value will basically match Market Price. But, temporarily they can differ. Then what happens? Usually, you think that whether the price of the thing purchased by you have that much price or not. Similar question will be asked in share trading

If **Market Price < Fair Value**: then Stock is under valued by the Market. It is a bargain and investors will rush to buy it. Therefore, Share's Demand will rise and Market Price will rise to match the Fair Value. Dynamic Equilibrium.

If **Market Price > Fair Value** then Stock is Over Valued

Share Price Valuation -Perpetual Investment in Common Stock:

Perpetual Investment in Common Stock

The PV Formula would require us to make Dividends Forecast for every year in future. Which is not feasible for us? Therefore, we can not use the old version of PV formula. We use 2 approaches to solve this problem.

Zero Growth Dividends Model:

In this we assume Perpetual Dividends at Zero Growth i.e. Constant Perpetual Dividends. Similar to Preferred Stock Valuation Formula i.e. $\text{DIV}_1 = \text{DIV}_2 = \text{DIV}_3$ In this method the simplification we made is this

In this there is a Fixed Regular Dividends Cash Flow Stream for every year in future. This is very simple method as the dividend for first year and the last year remains identical. It is a simple perpetuity model. Therefore we use **Perpetuity Formula**. Which is Similar to Preferred Stocks (Perpetual Investment) except Preferred Dividends (which are declared by the Company) not same as Common Stock Dividends (which are estimated).

The Formula for common stock

$$PV = P_0 = \text{DIV}_1 / (1 + r_{CE}) + \text{DIV}_1 / (1 + r_{CE})^2 + \text{DIV}_1 / (1 + r_{CE})^3 + \dots + \dots$$

$$= \text{DIV 1} / r_{CE}$$

Po^* is the Expected (Theoretical) Present Price. The Price depends on DIV1 which is the Expected Future Dividend for Year 1 (and all other years in future). There is difference in case of common stock & preferred stock. In common stock we assume the constant growth but in preferred stock the company has assured the preferred stockholder that he will get fixed rate of dividend.

Constant Growth Dividends Model:

In this, we need only to forecast the next year dividend and assume constant dividends Growth at Inflationary Growth Rate “g” which equals 5 - 10% pa (depending on country).

$$\text{DIV}_{t+1} = \text{DIV}_t \times (1 + g) \quad t, t = \text{time in years i.e. If } g = 10\%$$

Dividends Cash Flow Stream grows according to the Discrete Compound Growth Formula

$$\text{DIV}_{t+1} = \text{DIV}_t \times (1 + g) \quad t.$$

t = time in years.

So if you have estimated the present Dividend (DIV_0) or the next year's Dividend (DIV_1) then you can estimate all future dividends using this formula. In this, the trick is how to pick the right growth rate. Generally, we pick the rate of growth of inflation. As common stock holders we assume that the dividends are continue to grow at constant rate which is equal to rate of growth of inflation. If inflation rate is 10% then the dividend will grow at 10%. you have dividend of Rs 10 in first year then you will have dividend of Rs 10 plus 10% of Rs 10 which is equal to Rs.11.

Estimate Growth Rate = “g” using:

1. Financial Statements (calculate Dividends' growth rate)
2. Inflationary Growth Rate of Economy (say 5 - 10% pa)

Formula:

$$PV = Po^* = \text{DIV}_1 (1+g) / (1+ r_{CE}) + \text{DIV}_1 (1+g)^2 / (1+ r_{CE})^2 + \text{DIV}_1 (1+g)^3 / (1+ r_{CE})^3 + \dots$$

$$= \text{DIV}_1 / (r_{CE} - g)$$

DIV_1 = dividend for first year

In this we can derive the answer as sum of geometric series. Growing Perpetuity formula.

Example:

You are considering making a very long term investment in the common stock of Company ABC.

Your Required Return on the investment (based on risk) is 20% (r_{CE}). The present Dividend offered by Company ABC is Rs 4. Par Value is Rs 10.

Dividend Yield Pricing for Common Stock under Perpetual Investment

Zero Growth Model Pricing

$$PV = Po^* = \text{DIV}_1 / r_{CE} = 4 / 0.20 = \text{Rs } 20$$

Constant Growth Model Pricing (assume $g=10\%$)

$$PV = Po^* = \text{DIV}_1 / (r_{CE} - g) = 4 / (0.2 - 0.1) = \text{Rs } 40$$

Interpretation of Result:

Constant Growth Pricing gives a higher Estimate of Present Price because it assumes perpetual 10% compounded growth in dividends forever

COMMON STOCKS – RATE OF RETURN AND EPS PRICING MODEL**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Common Stocks – Rate of Return**
- **EPS Pricing Model**

In this lecture, we will continue our discussion on share price valuation and we discuss the common stock valuation in case of long term or perpetual investment.

First, we review what we have studied in the previous lecture. We have discussed 2 approaches of perpetual common stock valuation.

1. Zero growth :

In this we assume zero growth in dividends and our formula is

$$Po^* = \text{DIV1} / r_{CE} \quad (Po^* \text{ is being estimated}).$$

2. Constant growth rate:

In this we assume that dividend is growing at constant growth rate (inflationary rate). we can also use accounting data to calculate 'g'.

$$g = \text{plowback ratio} \times \text{ROE}.$$

In this particular case of constant growth model the formula for estimation of fair price is

$$Po^* = \text{DIV1} / (r_{CE} - g)$$

Now, we have studied about estimating the fair price of the common shares under a very long term investment but it is equally important to know the Required rate of Return (ROR).

In capital budgeting criterion, we have mentioned that we have to look both NPV as well as IRR. NPV is the price or value of the asset or security and IRR is the measure of the rate of return of a particular asset or project. So, we have to compute both NPV and IRR. Similarly, for the case of direct claim securities like share we can use the same equation and we can rearrange them for the required rate of return which is equal to r_{CE}

The Estimated Required Rate of Return for Investment in Common Equity (r_{CE}) can be calculated by re-arranging the same equation:

Dividends Pricing Models:**Zero Growth:**

$$Po^* = \text{DIV1} / r_{CE} \quad (Po^* \text{ is being estimated})$$

$$r_{CE}^* = \text{DIV1} / Po \quad (r_{CE}^* \text{ is being estimated})$$

Similarly,

Constant Growth:

$$Po^* = \text{DIV1} / (r_{CE} - g)$$

$$r_{CE}^* = (\text{DIV1} / Po) + g$$

Div Yield Cap.Gain Yield

This particular formula the way it is mentioned above is known as **Gordon's formula and we use this formula to calculate the required rate of return.**

Gordon's Formula: Estimated Fair Present Price (or Present Value) of Share calculated using Forecasted Future Cash Flows of Dividend Payouts to Shareholders and their growth

$$r_{CE}^* = (\text{DIV1} / Po) + g$$

In this the first part

(DIV1 / Po) is the dividend yield

g is the Capital gain yield.

The reason we use these terms is that basically (DIV1 / Po) is the fraction of the present price which represents by the dividends.

g the capital gain yields is simply the lumped measure of expected increase in dividend that you expect in the dividend over the life of the asset.

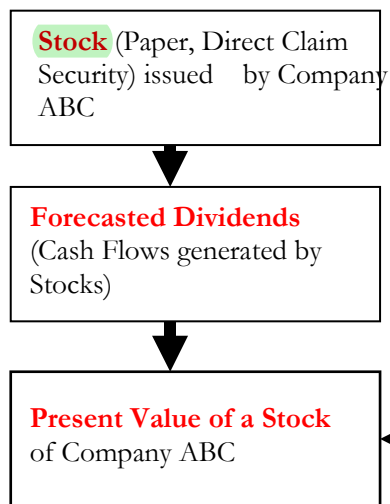
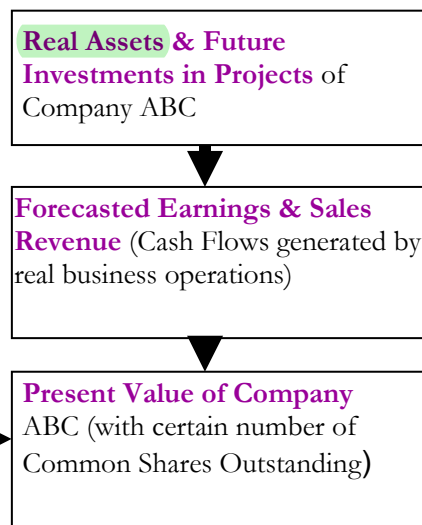
Now, if you see the formulas of stock valuation that we have discussed up till now. These formulas have used forecasted dividends and that is why we called these formula dividend yield approach to find the price. We have use dividends as a direct measure of cash flows that a stock holder receives from the security.

We mentioned that we will calculate value of an asset or security based on cash flows it will generates in the future. Any working asset can be valued based on its future cash flows.

So we began valuing shares based on dividend income that a share holder's receives. There is another approach for valuing shares.

Earnings per Share (EPS) Pricing Model:

In this our perspective is not the direct cash flows generated by the shares rather we value the shares based on cash flows that are generated by the company whose share we are taking. In other words, Estimated Fair Present Price of Share calculated based on Forecasted Future Cash Flows of Company's Earnings and growth from Ploughed Back Reinvestments (from Retained Earnings). We can do that because it is mentioned earlier that for direct claim securities like bond and stocks the value of security can be calculated from the cash flows of underlying assets. For share the underlying assets are the assets of the company and the cash flows generated by the assets of the company.

COMMON STOCK PRICING APPROACHES**DIVIDEND PRICING****E.P.S PRICING**

That is the logic behind the EPS approach. Now, let's see the EPS approach to calculate the price of the share.

EPS Approach:

In EPS approach, we estimate the price of common stock under very long term investment.

EPS Stock Price Estimation Formula

$$PV = P_0^* = \text{EPS } 1 / r_{CE} + PVGO$$

P_0 = Estimated Present Fair Price,

$\text{EPS } 1$ = Forecasted Earnings per Share in the next year (i.e. Year 1),

r_{CE} = Required Rate of Return on Investment in Common Stock Equity.

$PVGO$ = Present Value of Growth Opportunities. It means the Present Value of Potential Growth in Business from Reinvestments in New Positive NPV Projects and Investments. PVGO is perpetuity formula.

The formula is

$$PVGO = NPV \ 1 / (r_{CE} - g) = [-I_0 + (C/r_{CE})] / (r_{CE} - g)$$

In this PVGO Model: Constant Growth "g". It is the growth in NPV of new Reinvestment Projects (or Investment). $g = \text{plowback} \times ROE$

Perpetual Net Cash Flows (C) from each Project (or reinvestment).

I_0 = Value of Reinvestment (Not paid to share holders)

$$= P_b \times \text{EPS}$$

Where P_b = Plough back = $1 - \text{Payout ratio}$

Payout ration = (DIV/EPS) and

EPS Earnings per Share = $(NI - \text{DIV}) / \# \text{ Shares of Common Stock Outstanding}$

Where NI = Net Income from P/L Statement and DIV = Dividend, $RE_1 = RE_0 + NI_1 + \text{DIV}_1$

ROE = Net income / # Shares of Common Stock Outstanding.

Now when we look at the detailed method of calculating the NPV you will see that

$$\text{NPV 1} = [-I_0 + (C/r\text{CE})] / (r\text{CE} - g)$$

If we compare it with the traditional NPV formula

$-I_0$ = Value of initial investment

$(C/r\text{CE})$ = present value formula for perpetuities where you assume that you are generating the net cash inflow of C every year.

$$C = \text{Forecasted Net Cash Inflow from Reinvestment} = I_0 \times \text{ROE}$$

Where ROE = Return on Equity = NI / Book Equity of Common Stock Outstanding

In the EPS approach, in calculating the fair price of the common stock our conceptual logic was we calculate the value of the piece of paper based upon the cash flows the real company generated. We do this because the value of direct claim securities can be calculated from the underlying assets.

In EPS approach, we talk about the company and the cash flows that the company generates but in the case of dividends approach, we are talking about the cash flows directly generated from the piece of paper (i.e. dividends).

The PVGO in EPS approach formula is different from 'g'.

'g' it is the growth rate in dividends

PVGO is potential growth in the value of the business from the future investments in new projects. The basic model we used to estimate this present value of the company which is coming from investment in the future projects with +ve NPV is that we assume that the company saves their part of the net income in the form of retained earnings every year. So, in this particular model we are assuming that these retained earnings are invested in projects that will yield +ve NPV each year and the cash flows are constant. It also assumes that NPV from investment that a company makes in new projects grows at constant growth rate 'g' perpetually.

Example:

The Common Stock of Company ABC is trading in the Islamabad Stock Exchange at a market price of Rs 105. You are considering investing in it so you study the company's Annual Report, Financial Statements, and make some forecasts. The Data is as follows:

Forecasted Dividend Next Year = Rs 10

Expected Dividend Growth = 10% pa

Forecasted Earnings per Share = Rs 12

Your Required Return on Investment in ABC Common Stock = 20% pa.

Compute the Estimated Present Fair Price of Company ABC's Common Stock.

Dividend Pricing (Gordon's) Approach:

$$PV = P_0^* = \text{DIV}_1 / (r\text{CE} - g)$$

$$= 10 / (20\% - 10\%) = 10 / 0.10$$

= Rs 100 (Estimated Fair Price is less than Market Price of Rs 110 so share is **overvalued** in the Market)

Earnings Per Share (EPS) Pricing Model

$$PV = P_0^* = \text{EPS} / r\text{CE} + \text{PVGO}$$

$$\text{EPS} / r\text{CE} = 12 / 0.20 = \text{Rs } 60$$

$$\text{PVGO} = \text{NPV}_1 / (r\text{CE} - g) = [-I_0 + (C/r\text{CE})] / (r\text{CE} - g)$$

$$= [-(P_b \times \text{EPS}) + (I_0 \times \text{ROE} / r\text{CE})] / (r\text{CE} - g)$$

$$= [-(1/6 \times 12) + (2 \times 6/10 / 0.20)] / (0.20 - 0.10)$$

$$= [-2 + 6] / 0.10 = \text{Rs } 40$$

$$P_b = 1 - \text{Payout} = 1 - \text{DIV} / \text{EPS} = 1 - 10/12 = 1/6$$

$$g = P_b \times \text{ROE} = 10\% = 1/10 \quad \text{So ROE} = 6/10$$

$$PV = \text{Rs } 60 + \text{Rs } 40 = \text{Rs } 100 \quad (\text{Same as Dividend Approach}).$$

EPS Approach shows that 40% (i.e. Rs 40 out of Rs 100) of the Value is Growth Based (i.e. PVGO) –

Growth Stock:

It is growth share where the value of the share is determined by the potential of this company to grow its business as oppose to company which have low growth rate.

Particularly, for IT internet companies where we expect a high rate of growth for the business the PVGO term is large percent of the price of the share.

INTRODUCTION TO RISK, RISK AND RETURN FOR A SINGLE STOCK INVESTMENT**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Introduction to Risk**
- **Risk and Return for Single Stock Investment**

Before discussing this important topic we should go through the area of finance which we have studied up till now.

Part I (Introduction and Capital budgeting)

FM Markets, Concepts, Definitions
 Review of Accounting
 Interest Rate Theory & Calculations
 Investment Decisions: NPV (Valuation), IRR, Payback
 Capital Budgeting: NPV & DCF
 Capital Rationing (Budgeting for Real Assets)

Part II (Securities Valuation)

Valuation of Stocks & Bonds (Direct Claim Securities)

The Chapter 4 and 5 of text book cover the topics of risk and return. It is the fundamental concept to understand the topics of portfolio theory and Capital Asset pricing model (CAPM). In the previous lectures, we are ignoring the origin of required rate of return.

Risk:**Chinese Definition of Risk:**

It is defined as the combination of danger and opportunity. Risk is the combination of both.

When we talk about risk with the reference to the investment we are talking about risk in term of the uncertainty in outcome of our investment. We are talking about the variability, spread, or volatility that can take place in the expected future Value (Cash Flows) or Returns. For example, we are asking ourselves if we invest Rs 1,000 for buying a share today then what will be the price of the share one year from now. There is no guarantee about the price of the share after one year therefore there is an uncertainty or risk we are taking because we do not know the final outcome. So, the difference or variation in the possible outcomes of a particular investment also represents the risky ness of a particular investment.

As we have studied earlier that there are two major categories of assets

1 Real Physical Assets 2 .Financial Assets (Stock & bonds)

Risk can be understood with reference to the uncertainty of Future Cash Flows produced by Assets (Physical & Financial Securities). Businesses make forecasts based on certain assumptions which we have discussed in lecture 5 of your course. These forecasts are not 100% accurate and there is uncertainty in the possible outcome. The actual cash flows one or five years from now may be very different from the forecasted and this to represent risk. When we talk about risk in investing in direct claim securities then we need to keep in mind the distinction between Stand Alone Risk (or Single Investment Risk) as oppose to market or Portfolio Risk (or Collection of Investments Risk). which is a risk of particular investment compare to other investments you have made. In Portfolio risk we are interested in overall risk of entire collection of investments that made by the company. We will study this topic in the next lectures.

In case of portfolio risk we can further made distinction between Diversifiable Risk and Market risk

Diversifiable Risk: random risk specific to one company, can be virtually eliminated.

Market Risk: It is defined as uncertainty caused by broad movement in market or economy. More significant.

Causes of Risk:

These can be Company-Specific or General. It may be because of Cash Losses from operations or poor financial management of the company. This is one possibility but the real question is that why these losses occurred. One of the reasons for the losses might be the company's Debt, Inflation, Economy, Politics, War or Fate. Final analysis of risk is that it is a game of fate or chance.

Measurement of Risk:

It is important to attach different numbers to the risk so that we can rank different investments. Risk is measured in terms of the standard deviation or variance. You have studied these terms in the statistics. Risk is still quite subjective even after the numbers you have calculated after standard deviation. The reason is that you have to keep in mind what kind of risk you are talking about. Are you

Stand Alone Risk or Portfolio Risk?

Market Risk or Diversifiable Risk?

Stock Price Risk or Earnings Risk?

Another important thing is Time Horizon for which you are measuring the risk. Are you investing in Stocks over 1 Year or over 30 Years?

The level of risk might change as time period of the investment change.

Fundamental Rule of Risk & Return:

This rule can be summed up in saying that No Pain - No Gain. Investors will not take on additional Market Risk unless they expect to receive additional Return which is common sense and quite logical. Most investors are Risk Averse. Another important principle that one should keep in mind is Diversification.

Diversification:

It states that don't put all your eggs in one basket. Diversification can reduce risk. By spreading your money across many different Investments, Markets, Industries, Countries you can avoid the weakness of each. Make sure that they are Uncorrelated so that they don't suffer from the same bad news. Due to certain change in the interest rates some of the investments in your portfolio may go up and the others go downward.

Every Day Examples of Risk-Return Pairs:

	<u>Risk Level</u>	<u>Return</u>
• Climbing Mount K2	High	??
• Gambling on Cricket Matches	High	High
• Oil drilling in Badin Block	High	High
• Satta / Speculation in Shares	High	Med-High
• Construction Commercial Plaza	Medium	High
• Investing "Blue Chip" Stocks	Medium	Medium
• Crossing Road at Peak Traffic	Medium	??
• Investing TFC's	Med-Low	Low
• Depositing Money in Bank A/c	Low	Low
• Investing in T-Bills	Low	Low

Before taking about the risk we first see the different possible outcomes of a particular investment by analyzing the expected return. It is mentioned earlier that once we have an idea of the variation then we can measure the risk of that investment.

Range of Possible Outcomes, Expected Return:

Overall Return on Stock = Dividend Yield + Capital Gains Yield (Gordon's Formula)

Simply, Return is proportional to Capital Gain which is proportional to Selling Price. We can use Forecasted Selling Price as measure of Return. The wider the range of Possible Outcomes that can occur, the greater the Risk

The chance that a future event will actually occur is measured using Probability

Expected ROR = $\sum p_i r_i$

Where p_i represents the Probability of Outcome "i" taking place and r_i represents the Rate of Return (ROR) if Outcome "i" takes place. The Probability gives weight age to the return. The Expected or Most Likely ROR is the SUM of the weighted returns for ALL possible Outcomes.

Now let us take a look of case of investing in the share of the particular company.

Suppose you are deciding whether to invest in the Stock of Company ABC. You're not sure because the Future or Forecasted Price of the Stock after 1 year could reach any one of 3 Possible Values (or Outcomes). Before you can estimate the most likely or Mean or Expected Future Price, you need to guess the Probability of Each Possible Outcome

Outcomes (After 1 Yr)	Probability (%)
“Bull Market” (Stock Price $P1^*=140$)	30% or 0.3
“Normal Market” (Stock Price $P1^*=110$)	40% or 0.4
“Bear Market” (Stock Price $P1^*=80$)	30% or 0.3
	100% 1.0

P_o = Present Market Price Rs100. $P1^*$ = Forecasted Price.

The Sum of Probabilities of all Possible Outcomes MUST Add Up to 100% (or 1.0).

Payoff Table & Expected ROR

Payoff Table for Investment in Stock

Outcomes (1 Yr)	Prob (p)	ROR $\langle r \rangle = (P1^* - P_o) / P_o$
Price Rises ($P1^*=140$)	0.3	+ 40 % = $(140-100)/100$
Price Same ($P1^*=110$)	0.4	+ 10 % = $(110-100)/100$
Price Falls ($P1^*=80$)	0.3	- 20 % = $(80-100)/100$
	1.0	

Expected ROR of Investment in Stock

Most Likely or Weighted Average or Mean ROR Rate of Return $\langle r \rangle$

Expected ROR = $\langle r \rangle = \sum p_i r_i$

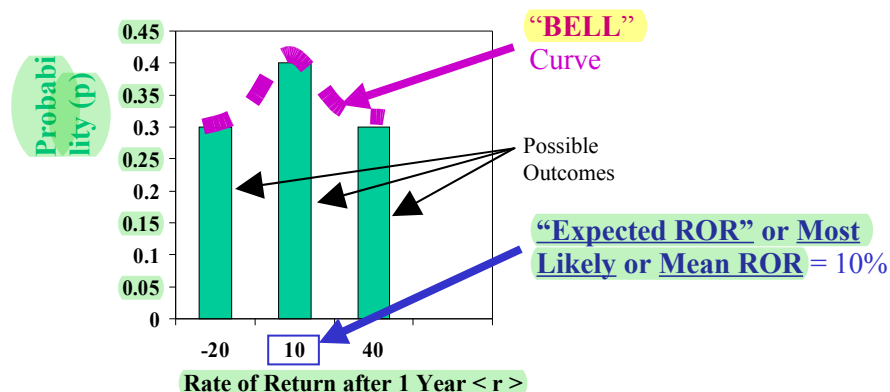
$$= p_1 (r_1) + p_2 (r_2) + p_3 (r_3)$$

$$= 0.3(40\%) + 0.4(10\%) + 0.3(-20\%)$$

$$= 12\% + 4\% - 6\% = 10\%$$

Probability Distribution

Forecasted Returns for Single Stock Investment



In the diagram, the probability graphed on y axis and the rate of return is graphed on x axis. All three outcomes are shown in the form of the bars. In this diagram the largest probability takes place at the value of the expected rate of return which is 10%. If the top of each vertical bar is connected then the bell curve is formed. It is easy to calculate the risk after calculating the expected rate of return. We simply use the formula of standard deviation to calculate the risk

Stand Alone Risk of Single Stock Investment:

The wider the range of Possible Outcomes (i.e. the greater the variability in potential returns) that can occur, the greater the Risk

Risk Measured using Standard Deviation (Note: Variance = Standard Deviation 2)

$$\text{Risk} = \text{Std Dev} = \sqrt{\sum (r_i - \langle r \rangle)^2 p_i} =$$

Summed over each possible outcome “i” with return “ r_i ” and probability of occurrence “ p_i .” $\langle r \rangle$ is the Expected (or weighted average) Return

This topic will be discussed in detail in the next lecture

RISK FOR A SINGLE STOCK INVESTMENT, PROBABILITY GRAPHS AND CO-EFFICIENT OF VARIATION

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics

- Risk for Single Stock Investment
- Probability Graphs and Coefficient of variation

In this lecture, we will continue our discussion on risk and return. This is very important area of financial management.

In previous lecture, we have mentioned an example for the investment in share and after one year the share price has 3 possible outcomes. This uncertainty in future price of the share that leads to the certain distribution in forecasted share price and this distribution is source of the uncertainty which allow us to calculate risk.

3 Possible Outcomes Example Continued:

Measuring Stand Alone Risk for Single Stock Investment

$$\begin{aligned}
 \text{Std Dev} = \delta &= \sqrt{\sum (r_i - \bar{r})^2 p_i} \\
 &= (\sum (r_i - \bar{r})^2 p_i)^{0.5} \\
 &= \{[(40-10)^2 (0.3)] + [(10-10)^2 (0.4)] + [(-20-10)^2 (0.3)]\}^{0.5} \\
 &= \{270 + 0 + 270\}^{0.5} = \{\text{Var}\}^{0.5} \\
 &= \{540\}^{0.5} = 23.24
 \end{aligned}$$

How do we interpret this Result for Risk?

Standard Deviation Interpretation

What are the units of Standard Deviation?

For our example where Return is being estimated in % terms, the units of Standard Deviation will also be %.

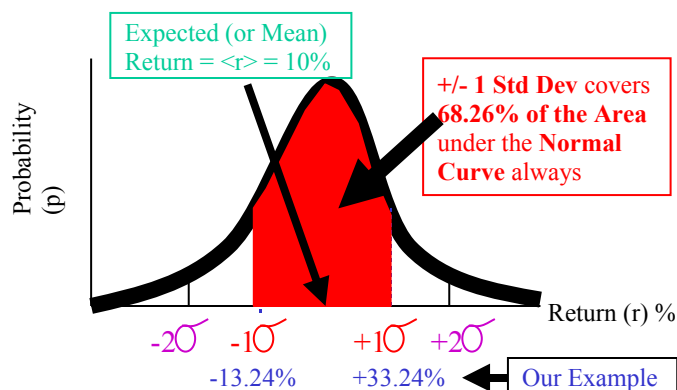
It tells us that if we assume a Normal Probability Distribution and symmetric about expected rate of return, then we conclude that 68.26% of the time, the Actual Return will lie within -1 Standard Deviation and +1 Standard Deviation of the Expected (or Mean) Return.

Expected (or Mean) Return = 10%

+/- 1 Standard Deviation = 10% +/- 23.24% which means from (10% - 23.24%) to (10% + 23.24%) i.e. from -13.24% to 33.24%.

There is a 68.26% chance that the Actual Return on our Stock Investment after 1 year will be somewhere between -13.24% and 33.24%. It is important thing to remember that in normal distribution the area under the curve from -1 standard deviation to +1 standard deviation is 68.28%. So, we can be sure that two thirds of the time the actual value for the return will be in between -13.68% and +33.24%. -13.24% is not a good sign as it indicates that we are making loss but remember that required rate of return is 10%.

Graphical Standard Deviation



In the figure the probability is written on y-axis and the rate of return is mentioned on the x-axis. It shows that higher the standard deviation the higher the risk.

Now, let's take another example in which we are comparing three different investments which we want to compare in terms of risk and return.

Example:

Comparison of 3 Investments in terms of Risk & Return. Which is the best Investment?

	Risk (Std Dev)	Expected Return
Stock A	23.24%	10%
T-Bill/Bond B	5%	10%
Project C	30%	30%

T-Bill is Least Risky (lowest Std Dev = 5%) and Project C has Highest Return (=30%).

Given 2 Investments with Identical Expected Return, choose the Investment with the Lower Risk (or **Spread** or **Volatility** or Standard Deviation)

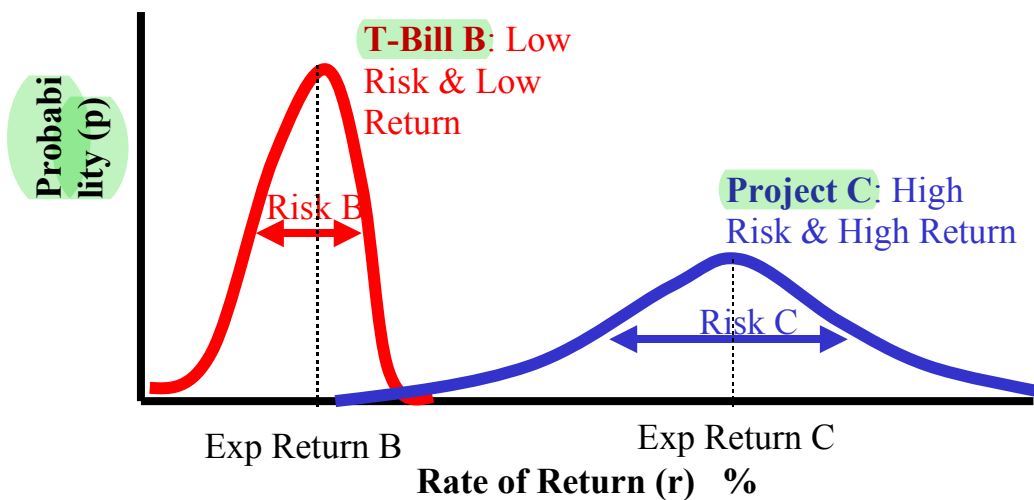
Given 2 Investments with Identical Risk, choose the Investment with the Higher Expected Return

If you compare first two investments, both have the same rate of return but the T-bills have less risk. Clearly, T-Bill B is a better investment than Stock A because their Returns are identical (10%) but the T-Bill is less risky (10%) than the Stock (23.24%).

But, which is better? T-Bill B or Project C? T-Bill B is Less Risky but Project C promises Higher Return.

Now, we conceptually visualize these two types of investment

Combined Risk & Return Graphical Comparison of Investments



In the figure, we are showing both investments on the same graph. Left hand shows the probability distribution for the T-bills and on the right hand side shows the broader and shorter probability graph for project C. How to visualize which project has higher expected rate of return. Project C is on the right hand side and therefore it has higher return as to project B. The other thing is that project B forms a probability distribution which has a sharp hill or spread of the curve is much narrower as to project C. The standard deviation for project B is much narrower than the standard deviation for project C. In project B has less risk whereas Project C has a higher expected rate of return. We have to look at risk and return simultaneously to answer that which option is better. We can derive the answer with the help of the coefficient of variation.

Comparison of Different Investments

Coefficient of Variation:

Coefficient of Variation (Risk per unit Return)

It is defined as the $CV = \text{Standard Deviation} / \text{Expected Return}$. Coefficient of Variation tells us about the Risk per unit Return. The project which offers lowest per unit risk is the best investment. Now we calculate the CV for both the projects.

Compare the CV's of the Projects:

$$CV \text{ T-bill} = 5\% / 10\% = 0.5$$

$$CV \text{ Project C} = 30\% / 30\% = 1.0$$

Choose the Project with the Lowest CV. Choose the T-Bill because it carries the lowest Risk per unit Return

Risk Aversion Assumption

Most Investors are psychologically Risk Averse. If two investments offer the same Expected Return, most Investors would choose the one with the lower Risk (or Standard Deviation or Spread or Volatility). In other words, most Investors are not major gamblers. Note that gamblers would choose Project C which appeals to investor greed by offering an upside return of $30\% + 10\% = 40\%$!

Consequences on Share Price: The Higher the Risk of a Share, the Higher its Rate of Return and the Lower its Market Price.

2- STOCK PORTFOLIO THEORY, RISK AND EXPECTED RETURN**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **2-Stock Portfolio Theory**
- **Risk & Expected Return**

In this lecture, we will continue our discussion on the risk. One of the easiest way of calculating risk using probability is by understanding the chance that are embedded in the game of cards and the fundamentals of probability are very easily understood. We discuss in this lecture calculation of risk using probability. But first we recap the previous concepts formula and

Recap of Risk Basics:

Risk: It arises because of Uncertainty, Volatility, and Spread in possible out comes. There are many possible outcomes (π_i) for Expected Rate of Returns (r_i).

It is measured using Standard Deviation or Variance.

$$\text{Risk} = \text{Std Dev} = \sigma = \sqrt{(r_i - \langle r \rangle)^2 \pi_i} = \text{“Sigma”}$$

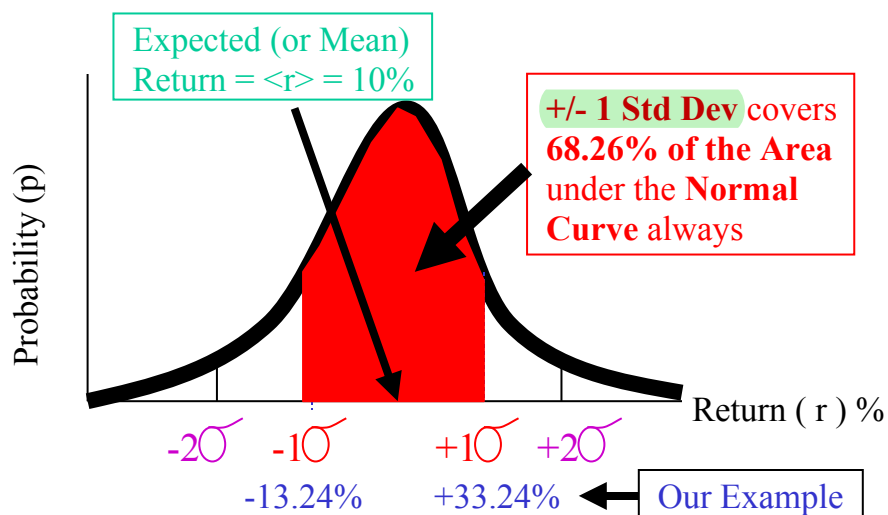
Bell Curve Assumption: In this it is assumed that the forecasted outcome of events will be distributed in the shape of a Normal Probability Distribution. The advantage we gain from using this that after calculating the standard deviation for any particular investment we have an idea that what the distribution or the spread of possible outcomes is going to be like. If you use normal distribution that we are sure that 68.26% of the times the Actual Future Rate of Return will lie within -1σ and $+1\sigma$ range

Coefficient of Variation: Investment Comparison Criterion used to simultaneously account for Risk & Return

$$CV = \sigma / \langle r \rangle$$

Our Objective is to minimize Risk & maximize Return.

$$\langle r \rangle = \text{Exp or Weighted Avg ROR} = \sum \pi_i r_i$$

Graphical Standard Deviation**Portfolio Risk & Return:****Portfolio:**

Portfolio is defined as a Collection of Multiple Investments. Most organization maintains large collection or portfolio of investments and when we talk about the risk and return then we have to consider overall risk and return for the entire portfolio. Portfolios may have 2 or more stocks, bonds, other securities and investments or a mix of all. We will focus on Stock Portfolios.

Risk is Relative:

The RISK from investing in Stock of Company ABC usually decreases as you make more Investments in other stocks of different unrelated companies. This is a logical fact because when you talk about one business which is earning you Rs 100,000 a month then you not look only on this business when you are running another business that is losing you Rs 200,000 a month,. You have to look at all the business and the overall rate of return you are generating, Similarly if you are investing in the bonds or stocks then you are need to look at the overall risk and return of the portfolio. The important thing to remember is that risk of particular share of company ABC will change if you are investing in that share after you have portfolio of many other stocks. If you already have large number of investments which you have made and then if you invest in particular share in company ABC will be different

Diversification:

The important thing to remember is that risk of particular share of company ABC will change if you are investing in that share after you have portfolio of many other stocks. If you already have large number of investments and then you invest in particular share in company ABC then the risk will be different. Investing in many Different Shares and Bonds and Projects of Different Companies in Different Countries can reduce risk. Diversified portfolios can reduce risk. The level of risk generally reduces as the size of the portfolio increase.

Portfolio Risk & Return:

What matters is the Overall Risk & Return on the entire Portfolio (or Collection) of Investments. The Risk & Return of an Individual Investment in a Stock or Bond should be seen in terms of its Incremental Effect on the Overall Portfolio

Investment Rule:

Investor will try to Maximize Portfolio Return and Minimize Portfolio Risk. Investor will NOT take on Additional Portfolio Risk UNLESS compensated with Additional Portfolio Return.

Types of Risks for a Stock:

Types of Stock-related Risks which cause Uncertainty in future possible Returns & Cash Flows:

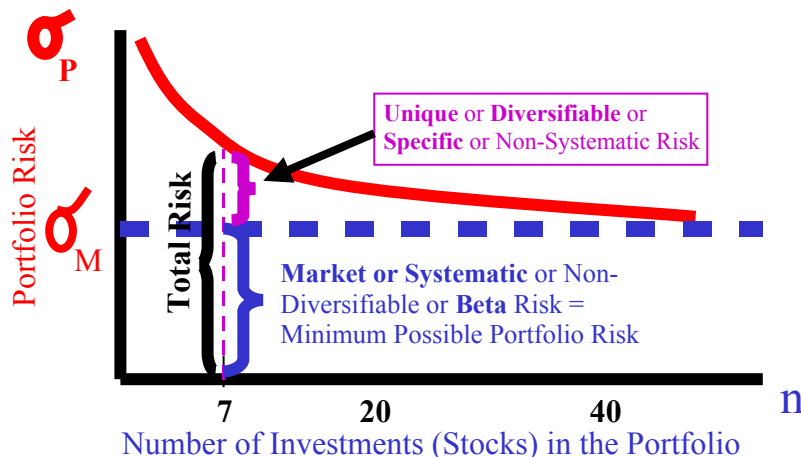
Total Stock Risk = Diversifiable Risk + Market Risk**Diversifiable Risk:**

It is known as Company-Specific or Unique or Non-Systematic Risk. It is associated with random events associated with Each Company whose stocks you are investing in i.e. Winning major contract, losing a court case, successful marketing campaign, losing a charismatic CEO,...Diversifiable Risk can be Reduced using Diversification. The bad random events affecting one stock will offset the good random events affecting another stock in your portfolio

Market Risk:

It is known as Non-Diversifiable or Systematic (Country-wide) or Beta Risk. It is associated with Macroeconomic or Socio-Political or Global events that systematically affect Stock investments in every Stock Market in the country i.e. Inflation, Macro Market Interest Rates, Recession, and War. Market Risk can NOT be reduced by Diversification

Portfolio Size vs Risk Graph



Note: About 100% of the Diversifiable Risk (and 50% of the Total Risk) can be removed by Diversification across 40 stocks. Just 7 carefully chosen Un-Correlated Stocks might be enough to remove 30% of the Total Risk.

Portfolio Rate of Return

Portfolio's Expected Rate of Return: (r_P).

It is the weighted average of the expected returns of each individual investment in the portfolio. Formula is similar to Expected Return for Individual Investment but interpretation is different:

Portfolio Expected ROR Formula:

$$r_P^* = r_1 x_1 + r_2 x_2 + r_3 x_3 + \dots + r_n x_n$$

Where there are "n" different investments (i.e. Stocks, Bonds, Projects,...) in your portfolio. r_1 represents the expected return (in % pa) on Investment No. 1 and x_1 represents the weight of Investment No. 1 (fraction of the Rupee value of the total portfolio that Investment No. 1 represents).

Example:

Suppose that you hold a Portfolio of 2 Stock Investments:

	Value of Investment (Rs)	Exp Individual Return (%)
Stock A	30	20
Stock B	70	10
Total Value =	100	

Expected Portfolio Return Calculation:

$$\begin{aligned}
 r_P^* &= r_A x_A + r_B x_B \\
 &= 20\% (30/100) + 10\% (70/100) \\
 &= 6\% + 7\% \\
 &= 13\%
 \end{aligned}$$

2 Stock Investment Portfolio Risk

Portfolio Risk is generally not the weighted average risk of the Individual Investments. In fact, it is usually less

Stock (Investment) Portfolio Risk Formula:

$$p = \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})}$$

Definition of Terms:

X_A is Investment A's weight in the total value of the Portfolio. σ_A is Investment A's Individual Risk (or standard deviation). ρ_{AB} is the Correlation Coefficient that measures the correlation in the returns of the two investments. Last term is a Covariance term

Example

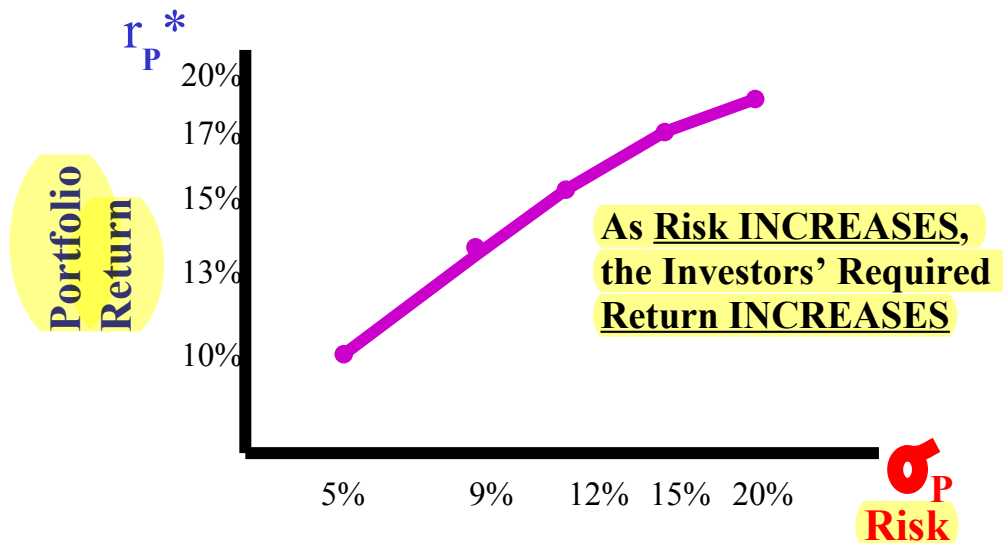
Complete 2-Stock Investment Portfolio Data:

	Value (Rs)	Exp Return (%)	Risk (Std Dev)
Stock A	30	20	20%
Stock B	70	10	5%
Total Value = 100		Correlation Coeff Ro = + 0.6	

2-Stock Portfolio Risk Calculation:

$$\begin{aligned}
 \sigma_P &= \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})} \\
 &= \{(30/100)^2 (20\%)^2 + (70/100)^2 (5\%)^2 + 2[(30/100)(70/100)(20\%)(5\%)(0.6)]\}^{0.5} \\
 &= \{(0.09)(0.04) + (0.49)(0.0025) + 2[(0.0021)(0.6)]\}^{0.5} \\
 &= \{0.0036 + 0.001225 + 0.00252\}^{0.5} \\
 &= \{0.004825 + 0.00252\}^{0.5} \\
 &= \{0.007345\}^{0.5} \\
 &= 0.0857 = 8.57\%
 \end{aligned}$$

$$X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})$$

Risk vs. Return Graph Example with 2-Stock Portfolio
with Positive Correlation


PORTFOLIO RISK ANALYSIS AND EFFICIENT PORTFOLIO MAPS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Portfolio Risk Analysis & Efficient Portfolio Maps**

Before starting the new concepts we should recap what we have studied in the previous lecture.

Recap:

Portfolio is a Collection of Investments in different Stocks, Bonds, other Securities or a mix of all. Its objective is to invest in Different Un-Correlated Stocks in order to minimize overall Risk & Maximize Portfolio Return. It is mentioned that individuals and companies maintain the portfolio in order to reduce the risk

There are 2 Types of Stock Risk

Total Stock Risk = Diversifiable + Market Risk

Diversification means expanding the number of investments which cover different kinds of stocks. We can reduce the risk as random events in one industry can be off set by the random effects in the other industry. This way you can reduce the company specific or unique risk. The market risk arises because of micro economic or large scale factors such as market interest rate, inflation etc. These factors have virtually identical effect on the share prices. For example, in event of a war stock market go down in value which means almost every share went down. 7 Stocks are a good number for diversification. 40 Stocks are enough for Minimizing Total Risk

Calculating Expected 2-Stock Portfolio Return & Risk

Expected Portfolio Return = $r_P = x_A r_A + x_B r_B$

Portfolio Risk is generally not a simple weighted average.

Up to this point we only look at the portfolio which has only two stocks.

Interpreting 2-Stock Portfolio Risk Formula:

$$= \sqrt{x_A^2 \sigma_A^2 + x_B^2 \sigma_B^2 + 2(x_A x_B \sigma_A \sigma_B \rho_{AB})}$$

Here, ρ_{AB} is coefficient of correlation which states that how much the investments are correlated. The risk of investing in any one share can be reduced if we invest in other shares also. There have been several experiment studies that show that if you invest in approximately 40 different uncorrelated different shares of different companies then you can entirely eliminate the company specific portion of the risk. Even if you can not diversify across 40 different companies but if you diversify just across 7 different shares from different companies then you can still you can reduce most of the diversifiable risk. No matter what we do we can not eliminate the market risk that market risk become the minimum risk we have to live with in our portfolio. The important thing then to remember is that how this risk will effected when we talk about portfolio of two stocks or more. The Correlation coefficient needs to be understood in order to understand the risk and return.

Correlation Coefficient (ρ_{AB} or “Ro”):

Risk of a Portfolio of only 2 Stocks A & B depends on the Correlation between those 2 stocks. The value of Ro is between -1.0 and +1.0

If $R_o = 0$ then Investments are Uncorrelated & Risk Formula simplifies to Weighted Average Formula.

If $R_o = + 1.0$ then Investments are Perfectly Positively Correlated and this means that Diversification does not reduce Risk.

If $R_o = - 1.0$, it means that Investments are Perfectly Negatively Correlated and the Returns (or Prices or Values) of the 2 Investments move in Exactly Opposite directions. In this Ideal Case, All Risk can be diversified away. For example, if the price of one stock increases by 50% then the price of another stock goes down by 50%.

In Reality, Overall Ro for most Stock Markets is about $R_o = + 0.6$. it is very rough rule of thumb. It means that correlations are not completely perfect and you should remember that if the correlation coefficient is +1.0 then it is not possible to reduce the diversifiable risk.

This means that increasing the number of Investments in the Portfolio can reduce some amount of risk but not all risk

Portfolio Risk - Example Recap

Complete 2-Stock Investment Portfolio Data:

	Value (Rs)	Exp Return (%)	Risk (Std Dev)
Stock A	30	20	20%
Stock B	70	10	5%
Total Value = 100		Correlation Coeff Ro = + 0.6	

2-Stock Portfolio Risk Calculation:

$$= \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})}$$

$$= \{0.0036 + 0.001225 + 0.00252\}^{0.5} = 0.0857 = 8.57\%$$

• 2-Stock Portfolio Return Calculation:

$$r_P^* = x_A r_A + x_B r_B = 6 + 7 = 13\%$$

Interpretation of Result:

The Portfolio Risk for our Basket of 2 Investments is **+8.57 %** (if Ro = + 0.6). What does this mean?

Bell Curve Assumption: If we assume a Normal Probability Distribution, then there is a 68.26% chance that our future Portfolio Return will be somewhere between ($r_P^* - \sigma$) and ($r_P^* + \sigma$) i.e. between (13% - 8.57%) and (13% + 8.57%) or between +4.43% and +21.57%

Portfolio Risk lies between the Individual Risks of the 2 Investments i.e

$$\sigma_{\text{Stock B}} < \sigma_P < \sigma_{\text{Stock A}} \text{ or } 5\% < 8.57\% < 20\% \text{ (if } R_o = +0.6\text{)}$$

You can also come up with more accurate outcome about the actual value of the return on the portfolio after 1 year if you take a larger range for the standard deviation. So, if you are taking about the range from -2 sigma to +2 sigma towards then there is likelihood that actual rate of return of the portfolio is somewhere in between the two standard deviation.

Note: If Ro = - 0.6 (Negative Correlation) then Portfolio Risk = + 4.8% which is lower than both Individual Investments!!

Now, we consider the case of negatively correlated investments.

Negatively Correlated Investments

2-Stock Investment Portfolio Data:

	Exp Indiv Return (ri)	Indiv Risk (Std Dev i)
Stock A	20%	20%
Stock B	10%	5%

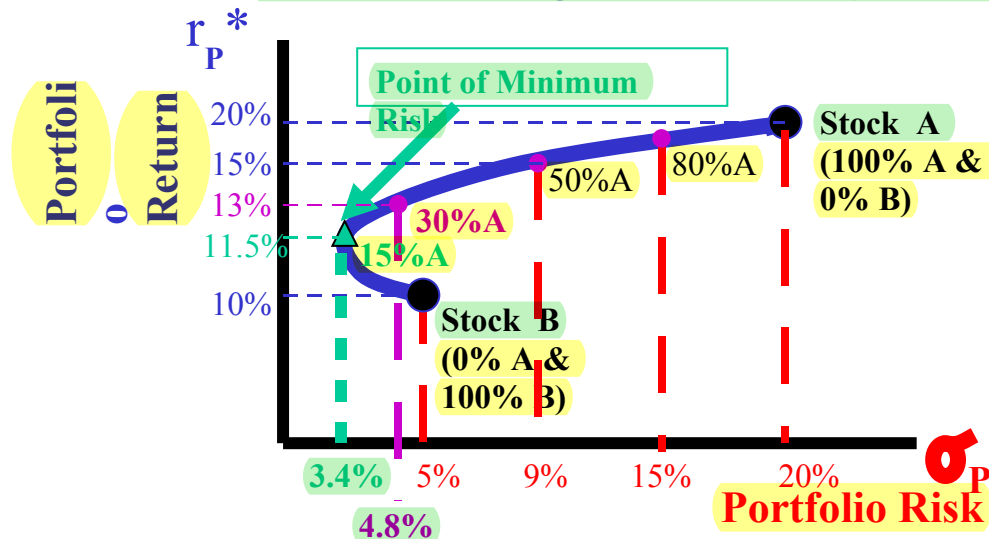
Correlation Coeff Ro = - 0.6

Portfolio Risk & Return Table (for Different Portfolio Mixes):

Fraction of Stock A	Portfolio Risk	Exp Portfolio Return (rP*)
100%	20%	20%
80%	15%	18% = 0.8(20) + 0.2(10)
50%	9%	15% = 0.5(20) + 0.5(10)
30%	4.8%	13%
15%	3.4%	11.5%
0%(i.e. 100% Stock B)	5%	10%

Efficient Portfolio Map

Efficient Portfolio Map Shows All Combinations of 2-Stock Portfolio Negative Correlation ($R_o = -0.6$)



Efficient Portfolio Interpretation

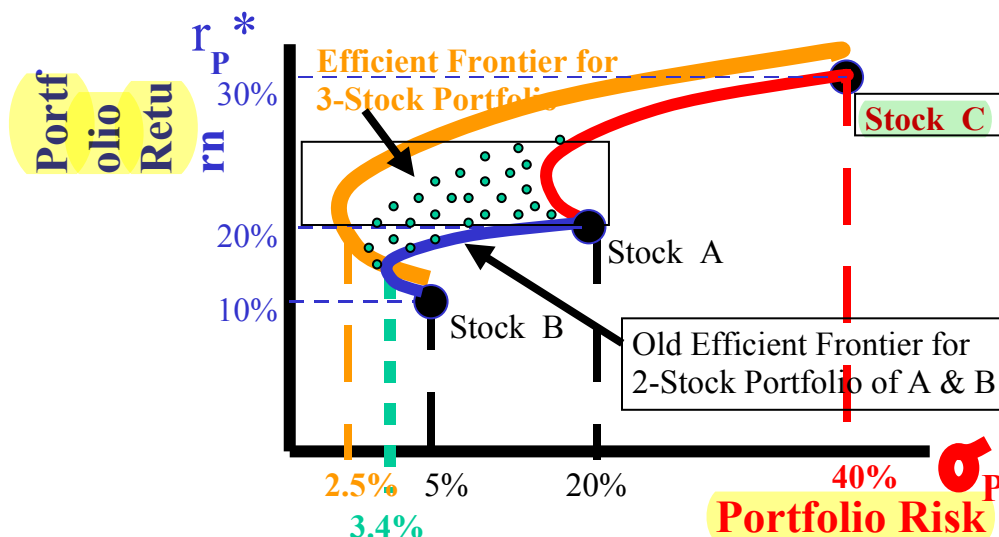
Efficient Portfolio Map for 2-Stock Portfolio shows all possible Efficient Combinations (Mixes) of stocks.

Efficient Portfolios:

Efficient Portfolios are those whose Risk & Return values match the ones computed using Theoretical Probability Formulas. The Incremental Risk Contribution of a New Stock to a Fully Diversified Portfolio of 40 Un-Correlated Stocks will be the Market Risk Component of the New Stock only. The Diversifiable Risk of the New Stock would be entirely offset by random movements in the other 40 stocks. Adding a New Stock to the existing Portfolio will create more Efficient Portfolio Curves. The New Stock will contribute its own Incremental Risk and Return to the Portfolio.

$$r_P^* = x_A r_A + x_B r_B + x_C r_C \quad (3 \text{ Stocks})$$

Efficient Portfolio Maps 3-Stock Portfolio Negative Correlation



Now, if we add another stock in the portfolio we can take a look

3-Stock Portfolio Risk Formula 3x3 Matrix Approach

	Stock A	Stock B	Stock C
Stock A	$X_A^2 \sigma_A^2$	$X_A X_B \sigma_A \sigma_B \rho_{AB}$	$X_A X_C \sigma_A \sigma_C \rho_{AC}$
Stock B	$X_B X_A \sigma_B \sigma_A \rho_{BA}$	$X_B^2 \sigma_B^2$	$X_B X_C \sigma_B \sigma_C \rho_{BC}$
Stock C	$X_C X_A \sigma_C \sigma_A \rho_{CA}$	$X_C X_B \sigma_C \sigma_B \rho_{CB}$	$X_C^2 \sigma_C^2$

To compute the **Portfolio Variance** for a 3-Stock Portfolio, just add up all the terms in every box. To compute the Portfolio Risk (Standard Deviation), simply take the Square Root of the Variance. **You can extend this Matrix Approach to calculate the Risk for a Portfolio consisting of any number of stocks.**

Terms in Boxes on Diagonal (Top Left to Bottom Right) are called “**VARIANCE**” terms associated with individual magnitude of risk for each stock.

Terms in all other (or NON-DIAGONAL) Boxes are called “**COVARIANCE**” terms which account for affect of one stock’s movement on another stock’s movement.

EFFICIENT PORTFOLIOS, MARKET RISK AND CAPITAL MARKET LINE (CML)**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics.

- **Efficient Portfolios,**
- **Market Risk & CML**

First we recap the important concepts which we have studied in previous lectures. Portfolio theory is looking at the relationships between the risk and return for portfolios, especially for diversified portfolios.

Total Stock Return = Dividend Yield + Capital Gain Yield

You should recall this from the Gordon formula that we learnt in the share valuation.

We spoke about the total risk for the stock and we said that it is equal to the company's risk plus the market risk.

Total Risk = Diversifiable Risk + Market Risk

We mentioned that on the basis of experimental studies that if we invest in many stocks which are not correlated to each other then it is possible to reduce overall risk for your investment as a whole. We called this portfolio or collection of stocks. **7 Stocks** are a good number for diversification & **40 Stocks** are enough for eliminating Company Risk & Minimizing Total Risk.

Now, in the portfolio theory model which we are going to discuss the major assumption is that the rational investors in the market place maintain diversified portfolios. We discuss in the previous lecture about calculating expected return on the portfolio and we mentioned that it is simply the weighted average of return of each stock in the portfolio. The formula

$$\text{2-Stock Portfolio's Expected Return} = r_p = x_A r_A + x_B r_B$$

2-Stock Portfolio Risk Formula

$$S_d = \sqrt{x_A^2 \sigma_A^2 + x_B^2 \sigma_B^2 + 2(x_A x_B \sigma_A \sigma_B \rho_{AB})}$$

It is mentioned in the previous lecture that we can calculate the risk of larger portfolio using the matrix approach

Matrix for Calculating Portfolio Risk: Covariance Terms (Non-Diagonal Boxes) measures (1)

Magnitude of movement (Standard Deviation) and (2) **Closeness of movement (Correlation Coefficient)** between any two stocks in the portfolio.

3-Stock Portfolio Risk Formula 3 x 3 Matrix Approach

	Stock A	Stock B	Stock C
Stock A	$x_A^2 \sigma_A^2$	$x_A x_B \sigma_A \sigma_B \rho_{AB}$	$x_A x_C \sigma_A \sigma_C \rho_{AC}$
Stock B	$x_B x_A \sigma_B \sigma_A \rho_{BA}$	$x_B^2 \sigma_B^2$	$x_B x_C \sigma_B \sigma_C \rho_{BC}$
Stock C	$x_C x_A \sigma_C \sigma_A \rho_{CA}$	$x_C x_B \sigma_C \sigma_B \rho_{CB}$	$x_C^2 \sigma_C^2$

To compute the **Portfolio Variance** for a 3-Stock Portfolio, just add up all the terms in every box. To compute the Portfolio Risk (Standard Deviation), simply take the Square Root of the Variance.

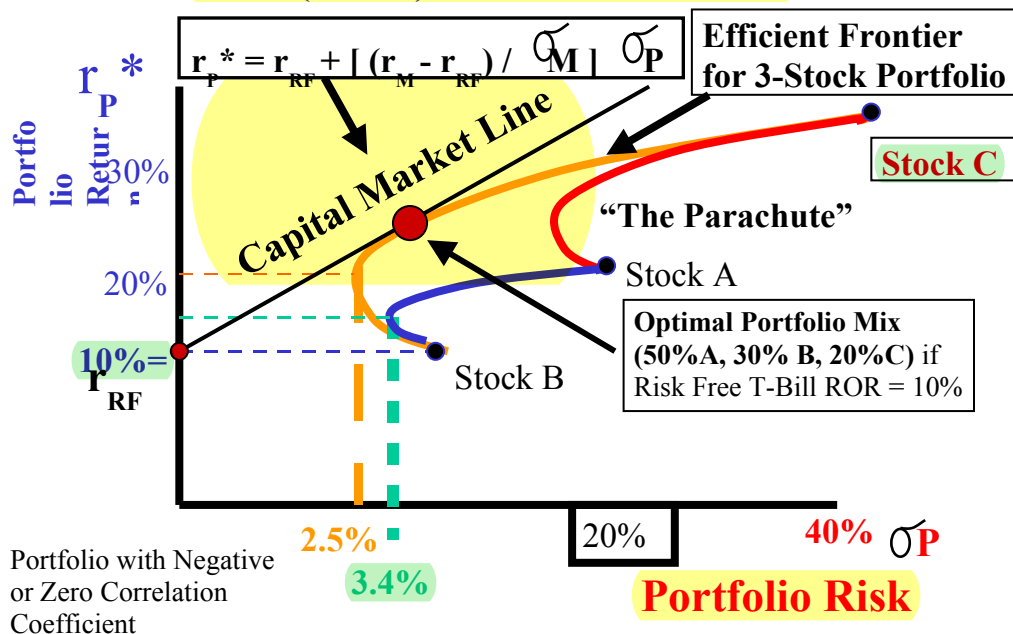
You can extend this Matrix Approach to calculate the Risk for a Portfolio consisting of any number of stocks.

- Terms in Boxes on Diagonal (Top Left to Bottom Right) are called “**VARIANCE**” terms associated with individual magnitude of risk for each stock.
- Terms in all other (or NON-DIAGONAL) Boxes are called “**COVARIANCE**” terms which account for affect of one stock’s movement on another stock’s movement. These represent the magnitude or size of the movement between the two stocks. There are two parts for this covariance terms
- One of the two covariance terms for two stock portfolios is $X_A X_B \sigma_A \sigma_B \rho_{AB}$.

Both standard deviation and covariance are important to calculate the size of the movement of both stock A and B. In other words, if covariance is large then a pair of stock moves a lot and they also move together. Correlation coefficient is the measure that how closely they move Standard deviation tells us that how much they move.

We have discussed in the previous lecture about the efficient portfolio map and the efficient frontier. If we plot the risk and return for the portfolio whose correlation coefficient is negative then we come up with a hook shape curve and it tells us that it is possible to increase the return on portfolio & at same time reduce the risk which is ideal because the objective is to maximize the return and to minimize the risk. But in conclusion of last lecture we said that there is a whole line with infinite number of points that represents an efficient frontier and every single combination or mix of the portfolio on this line represents an efficient combination. But this does not help us very much why because we do not know which one of these mix is the best. So, the first thing we are going to figure out is that what optimal mix of the portfolio is. The starting point to figure out this is to realize that if you have a portfolio of stocks then every investor have access to another portfolio and that portfolio is the portfolio of T bills and we are going to assume that every body have the option of investing in the T-Bills that give them the risk free rate of return. For Pakistan, we consider that figure to be 10%.So; this is the starting point to figure out that what is the optimal portfolio mix is. The realization that if your portfolio is giving you the return which is less then risk free rate of return then why would you investing in that portfolio and you would choose to invest in T-bills. By using this understanding, let’s take another look on risk and return portfolio frontier model and see that how we can use this fact to find the optimal portfolio mix and we take look at 3 stock portfolio consisting of stock A, B and C and added to that we will give ourselves the option of investing in a T-bill portfolio wherever stocks are not providing sufficient return. So, if we look at the efficient portfolio map you will see that **Portfolio risk is on X- axis and the portfolio return on Y- axis.**

Picking Most Efficient Portfolio Capital Market Line (CML) & T-Bill Portfolio



The efficient frontier for the 3 stock portfolio is the overarching largest hook shaped curve and also remember that closed combination of the all the hook shaped curves forms a parachute like shape and any one of the points inside that parachute is a possible mix or combination of different stocks that you can have in your portfolio. However, the most efficient combinations lie on the efficient frontier line and the next logical step we are going to take is to figure out what is the best point on the efficient frontier. As it is mentioned that we will assume that we have access to T-bill portfolio which offers a risk free rate of return of 10% and that will be the starting point of our capital market line (CML). wherever this line if you extend from the 10 % point from y-axis touches the efficient frontier line and is tangent to it is the point for the “Optimal Portfolio Mix.” This point is shown as a large dot in the above figure. If you look at the location of this large dot on the efficient frontier you can see that it lies closer to the Stock B and Stock A. Therefore, there is larger percentage of stock A and B in this optimal portfolio mix. Approximately, the optimal portfolio mix consist of 50% Stock A, 30% Stock B, and 20% Stock C. It is important to remember that we have the option of investing in the T-bill portfolio which offers a risk free rate of return

And the expected rate of return is 10%. Therefore, if the returns on this portfolio decrease 10% then the investor will invest in the risk free T-bills portfolio. Whichever portfolio offers lowest coefficient of variation is the better portfolio. The CML represents different combinations that you can pick in the risk free as well as stock portfolio. Thus CML represents combination of efficient portfolio in the capital market. It is the important point remembers that According to the Portfolio Theory, Efficient Portfolios are Fully Diversified and they must lie on the CML Line. Now, it is also possible simply come up with the equation for the CML.

CML Equation: $r_P^* = r_{RF} + [(r_M - r_{RF}) / \sigma_M] \sigma_P$

r_{RF} = risk free rate of return

r_M = expected rate of return for the market of all possible stock

σ_M = risk of the market

σ_P = risk of stock portfolio

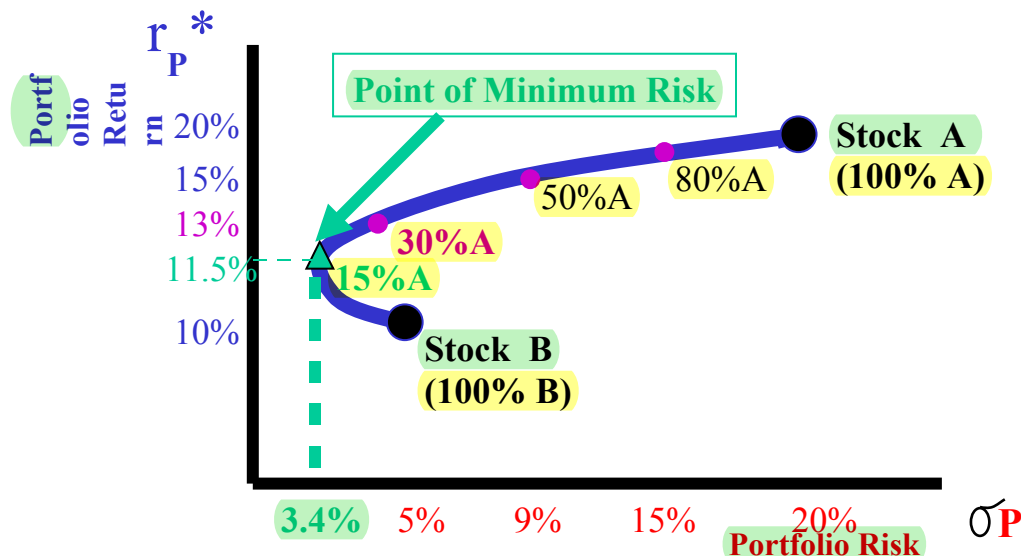
The Expected Return on an Investment in a Common Share is not guaranteed or certain. The Price and Dividend can vary so we can guess what the Possible future Returns (or Outcomes) might be and assign probabilities to each. Uncertainty about Future Expected Return on Investment gives rise to Probability Distribution of Possible Outcomes. This gives rise to a Spread of Possible Future Returns which is a measure of the Risk or Uncertainty or Standard Deviation. We can apply this

concept to the single stock or a portfolio of a many stocks. When we talk about the expected return on a single stock then we are saying that it is the combination of the dividend gain yield and the capital gain yield. When we talk about the expected return for the portfolio then we consider expected return for each stock in that portfolio and assign proportionate amount of weightage based on the fraction of the investment in a particular stock compare to the total value of the portfolio. Furthermore, the individual risk of every investment affects the risk of every other investment in the portfolio! The Overall Portfolio Risk decreases as the number of investments increase up to the point that the Company Specific or Unique Risk has been totally eliminated i.e. About 40 uncorrelated stocks. **In this Range it is possible to Increase Return and Reduce Risk!** After that, the Portfolio is assumed to be Fully Diversified and any additional investment will only contribute to the Market Risk which can not be eliminated.

Market Risk & Portfolio Theory:

We can measure that how market risk varies from one stock to another based on the Beta's. It is mentioned that when you add newly stock to the fully diversified portfolio then the only contribution this new stock is made to the risk of the existing portfolio is the market risk because we are considering that company's unique risk has entirely wiped out by diversification. If the correlation between different stocks is negative or Zero then risk and return profile graph takes on a hook shaped curve and this hook shaped curve is important to understand because it means that it is possible for certain combinations of the portfolio to both reduce risk and increase return.

Hook Shaped Curve Negative Correlation Coefficient Possible to Get Higher Return AND LOWER RISK



However, if the correlation coefficient is +ve then the risk return relationship is that of continuous function which is continuously rising as return rises the risk also rises with it. It is the fundamental concept in risk and return that the investor will not take on any additional risk unless they compensated by additional return. It is important to understand that when we are talking about efficient capital markets and talking about the capital market line we are saying that efficient portfolios in the market all lie on the capital market line. It means that if one investor is only investing in the stock A and the other has a diversified portfolio of 40 stocks and now he is also investing in Stock A then the amount of risk for both investors will be different the investor who is only investing in stock A is taking on the Market risk of the stock as well as the company's risk whereas the other investor is only taking on the market component risk for that stock. **Rational Investors with Diversified Portfolios expect to be compensated by extra return in exchange for taking on Extra Market Risk.**

You can NOT expect to receive extra return (or compensation) for taking on Company-Specific Risk which Rational Investors have eliminated! The Efficient Market will only offer you a Return (and a Share Price) which is the bare minimum acceptable to Rational Diversified Investors. This is the Basis of the Capital Asset Pricing Model (CAPM).

Beta Concept & CAPM:

Beta:

It is a tendency of a Stock to move with the Market (or Portfolio of all Stocks in the Stock Market). It is the building block of CAPM.

Stock Risk vs. Stock Beta:

Stock Risk:

It is a statistical spread of possible returns (or Volatility) for that Stock

Stock Beta:

It is a statistical spread of possible returns (or Volatility) for that Stock relative to the market spread i.e. spread (or Volatility) of the fully diversified market portfolio or index.

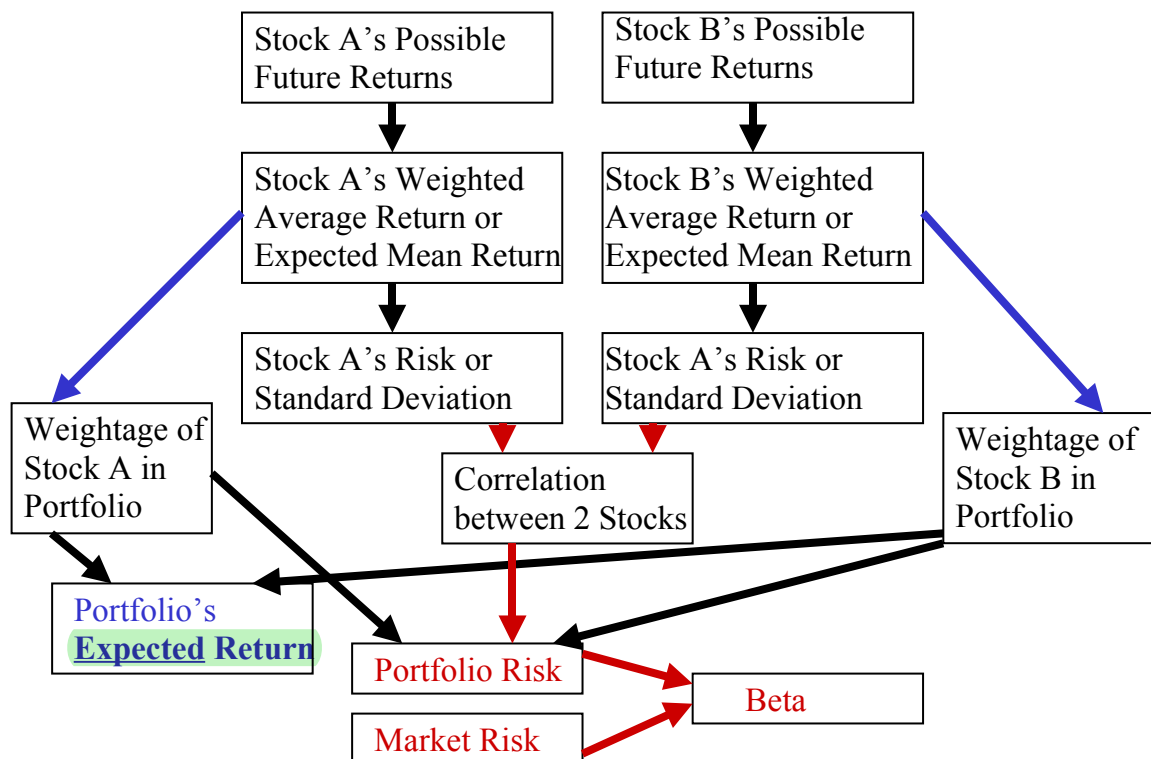
Beta Coefficients of Individual Stocks are published in “Beta Books” by Stock Brokerages & Rating Agencies

CAPM: Capital Asset Pricing Model.

It is developed by Professors Sharpe & Markowitz. He won Nobel Prize in 1990

Market Risk is the only risk that is relevant to a Rational Investor with a Diversified Portfolio of Investments. The Company Specific (or Unique) Risk is Diversified Away! Market Risk is measured in terms of the Standard Deviation (or Volatility) of the Market Portfolio or Index. Every Stock Market develops an Index comprising of a weighted average of the highest-volume shares in that market. This Index represents the relative strength of that Stock Exchange and is considered to be close to a Totally Diversified Portfolio. In reality, no such Portfolio exists anywhere in the world. For example the Karachi Stock Exchange has the KSE 100 Index.

Return, Risk, and Beta



STOCK BETA, PORTFOLIO BETA AND INTRODUCTION TO SECURITY MARKET LINE (SML)

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics.

- **Stock Beta**
- **Portfolio Beta**
- **Introduction to SML (CAPM)**

First, we would recap some of the concepts which we have studied in the previous lectures. It is mentioned in the efficient capital markets the investors would take on extra risk only if they are compensated in the form of extra return. The market only compensates the investor to the extent that he will receive extra return for extra market risk he takes on by investing in a new stock. However, the market will not pay the investor any extra return for taking on unnecessary risk in the form of company's own risk. Therefore, it is best for investors to act rationally and to maintain diversified portfolios of many stocks and in this manner they can eliminate the company's own risk and they can make investments in stocks at a lower required rate of return. Market portion of risk can be represented through the 'Beta' coefficient and it is the corner stone for Capital Asset Pricing Model (CAPM).

Beta:

It is a tendency of a Stock to move with the Market (or Portfolio of all Stocks in the Stock Market). it is the building block of CAPM.

Total Risk = Diversifiable Risk + Market Risk

Total Stock Return = Dividend Yield + Capital Gain Yield

Stock Risk Vs Stock Beta:

Stock Risk:

It is a statistical spread of possible returns (or Volatility) for that Stock

Stock Beta:

It is a statistical spread of possible returns (or Volatility) for that Stock relative to the market spread i.e. spread (or Volatility) of the fully diversified market portfolio or index.

Beta Coefficients of Individual Stocks are published in "Beta Books" by Stock Brokerages & Rating Agencies

MARKET:

It is the overall Stock Market. For Example, Karachi Stock Exchange. KSE 100 Index represents Value of "Portfolio" of Highest Volume Stocks but NOT ALL stocks. Therefore it is not fully perfect diversified portfolio.

Market carries Risk. It moves up and down because of macroeconomic factors (inflation, general interest rates) and political changes. Therefore the market has some expected rate of return which changes with time because of this there is possibility of different outcomes. There are no fully diversified portfolios in reality. The CAPM based on the premise market Beta to be Equal to + 1.0. We can then look at the different beta and compare them with the markets.

Meaning of Beta for Share ABC in Karachi Stock Exchange (KSE):

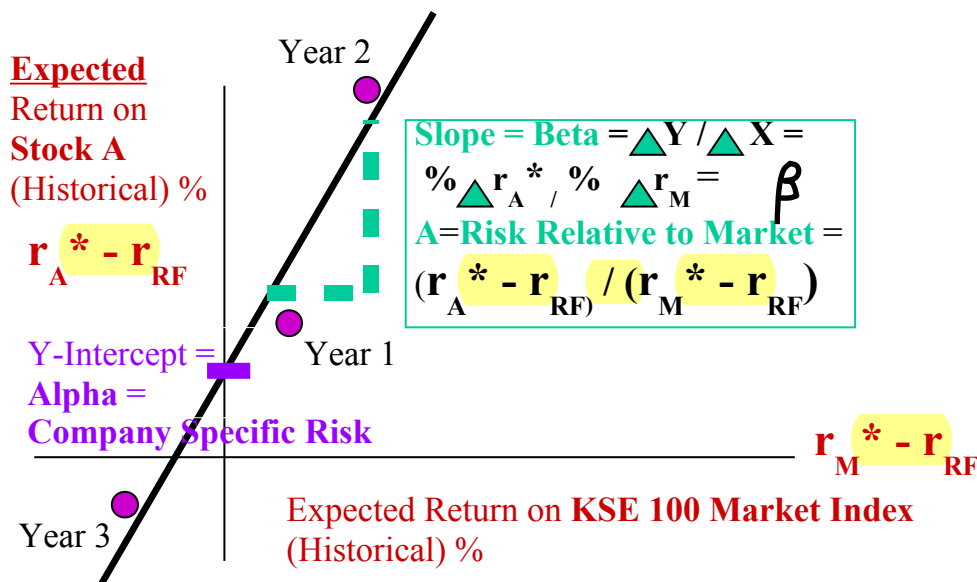
- If Share A's Beta = +2.0 then that Share is Twice as risky (or volatile) as the KSE Market i.e. If the KSE 100 Index moved up 10% in 1 year, then based on historical data, the Price of Share B would move up 20% in 1 year.
- If Share B's Beta = +1.0 then that Share is Exactly as risky (or volatile) as the KSE Market
- If Share C's Beta = +0.5 then that Share is only Half as risky (or volatile) as the KSE Market
- If you could find a Share D with Beta = -1.0 then that share would be exactly as volatile as the KSE Market BUT in the opposite way i.e. If the KSE 100 Index moved UP 10% then the price of the Share D would move DOWN by 10%!
- The Beta of most Stocks ranges between + 0.5 and + 1.5
- The Average Beta for All Stocks = Beta of Market = + 1.0 Always.

Our approach for calculating the beta will be straight forward. Let us assume that we analyze the movements in KSE index for period of three years and we also analyze the price movements for the Stock A in KSE for the same period of time of three years. We look at the change in the price of the

stock and compare it to the change in price in the market for each one of the three years separately. And then we plot those points on a graph where the expected return on the stock on the y- axis and the expected return on the market on x-axis. We are using the price of the stock and value of the index as representative measures for the expected return.

Calculating Stock Beta Graphically

Linear Regression or Least Squares Fit through Experimental Data Collected for 3 Years



If you look at the graph, we have plotted three years of data for the changes in the Karachi stock exchange 100 market index and the expected return on the stock A. The expected return on A is on y-axis and it is represented by r_A^* and the expected return on stock in KSE 100 market index is represented by r_M^* the “*” represented the expected part of the rate of return. In both cases the expected returns have been benched marked against the risk free rate of return. That is because we pick the risk free rate of return as the starting point for the changes in the expected return. Three points are shown on the graph on for each year in the analysis and after plotting these points on the graph we can then do what is known as the linear regression of straight line which best fit through points. You have studied this concept in the course of “Statistics and Probability”. The slope of the line represents the beta coefficient.

$$\text{Slope} = \text{Beta} = \Delta Y / \Delta X = \% \Delta r_A^* / \% \Delta r_M^* \\ = A = \text{Risk Relative to Market} = (r_A^* - r_{RF}) / (r_M^* - r_{RF})$$

Beta represents the risk of stock relative to the return of the market and in terms of risk free rate of return we can define the Beta as the expected rate of return for stock A minus risk free rate of return divided by the expected rate of return for the market minus risk free rate of return. We use historical data of expected rate of return and we graphed it against changes in the overall market index

Calculating Portfolio Beta (CAPM):

There are two ways of calculating portfolio beta

- Analyze Historical Data for Portfolio Returns and Market Index Returns like in the case of Stock Beta, plot Least Squares Fit Line, and compute Portfolio Line Slope or Beta directly.
- Use the Published Data for **Individual Stock Betas from the “Beta Book”**

Portfolio beta can be calculated as the sample weighted average of the stock beta’s in that portfolio.

$$\text{Portfolio Beta} = \beta_P = X_A \beta_A + X_B \beta_B + X_C \beta_C + \dots$$

In the formula

β_A represents the Beta (or Market Risk) of Stock A.

X_A represents the Weight of Stock (fractional value of investment in A to total portfolio value). The simple formula for calculating the portfolio beta is as follows.

Portfolio Beta (or Market Risk) Formula is a Simple Weighted Average unlike the portfolio risk formula

$$\sigma P = \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})}$$

Example:

- Complete 2-Stock Investment Portfolio Data:

	Value	Exp Return (r*)	Tot Risk	Beta
Stock A	Rs.30	20%	20%	2.0
Stock B	Rs.70	10%	5%	0.5
Total Value =Rs 100		Correlation Coefficient = + 0.6		

Portfolio **Mean Expected Return** = **13%** = r_{P^*}

Portfolio **Risk** (Total) = **8.57%** = **P (relative to r_{P^*})**

Now we can calculate the portfolio beta which is measure of the market portion of portfolio risk.

Portfolio **Beta** = $X_A \beta_A + X_B \beta_B = (30/100) (2.0) + (70/100) (0.5) = 0.6 + 0.35$

= **+0.95** = β **P (relative to Market Risk or Volatility)**

It means that the Portfolio of A & B is slightly less risky than the totally diversified KSE 100 Market Portfolio whose Beta = +1.0

Effect of New Stock Investment on Portfolio:

Now we will see the case that what will happen to portfolio beta if we add another stock to it.

Suppose, you add a 3rd Investment Stock C, to your Old 2-Stock Portfolio.

	Value	Exp Return (r*)	Beta
Stock A	Rs.30	20%	2.0
Stock B	Rs.30	10%	0.5
Stock C	Rs.40	30%	1.5
Total Value	Rs.100		

3-Stock Portfolio Beta = $\beta P = X_A \beta_A + X_B \beta_B + X_C \beta_C$

= $(30/100) (2.0) + (30/100) (0.5) + (40/100) (1.5)$

= $0.6 + 0.15 + 0.6 = 1.35$

The effect of adding a stock with a Beta higher than the Portfolio's is that it increases the Portfolio's Beta or Risk. In this case we also increase the beta by adding new stock but the expected rate of return also increases for the portfolio. So, the increase rate of return would compensate the increase in risk.

Required Rate of Return (CAPM)**Required ROR vs. Expected ROR****Expected ROR (r^*):**

The Most Likely (or Mean) ROR expected in the future. It is calculated using **Weighted Average Formula** and Probabilities (what we have been calculating so far). It is basically the weighted average or mean of the expected return of the individual investments in the portfolio.

Required ROR (r):

It is the minimum return that investors require from the stock to invest in it. It varies from individual to individual. It is based on

- 1) Perceived Risk relative to the Market and Psychological Risk Profile of each Investor and
- 2) His personal Opportunity Cost of Capital preference.

We have mentioned earlier that ROR or opportunity cost varies from person to person because every individual have a different preference for risk taking. Some people have tendency to be gamblers whereas other people put their money at national saving schemes. However, the ROR can be linked to the Beta risk because based on the portfolio theory and CAPM where we mentioned there is direct relationship between risk and return.

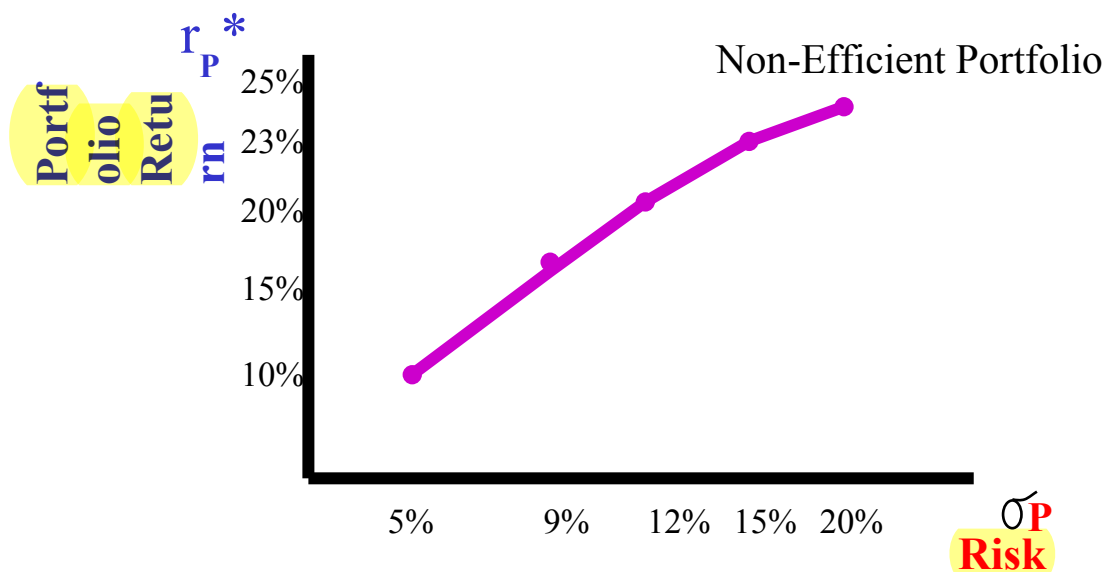
Average Required ROR for all rational investors in an Efficient Market can be estimated using the CAPM Theory: Beta and Risk Free Rate of Return.

Total Rate of Return (ROR) for Single Stock = Dividend Yield + Capital Gain. GORDON'S FORMULA FOR COMMON STOCK PRICING OR VALUATION USES REQUIRED RETURN $r = \text{DIV}/P_0 + g$. In Efficient Markets, Price of Stocks is based on Market Risk (or Beta).

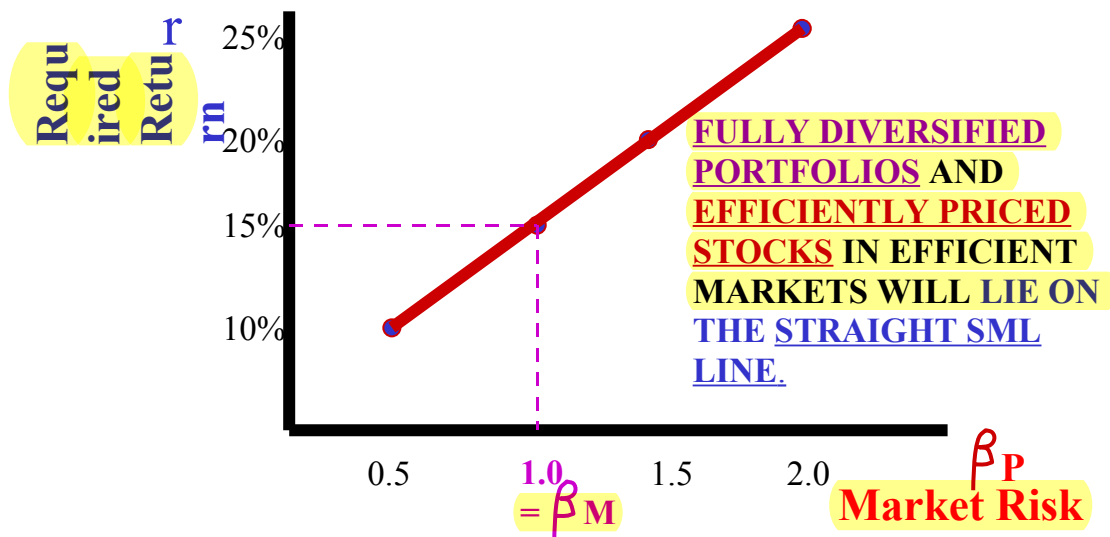
We can formulate the required rate of return in terms of Beta risk so how can we use beta coefficient to calculate the required rate of return for the average investor in the market. The answer to it is the

Security Market line SML. It is the part of CAPM and it is the most critical part of CAPM. SML is straight line relationship that contains all possible combinations of efficient stocks in the market. If the combination of risk and return for any stock does not lie on the SML then that stock is not efficiently priced. In other words, it means that for most of the investors in the market there ROR for investment in stock A is directly proportional to Beta risk for that stock A. You will recall that we are not unfamiliar with straight line relationship between risk and return when we are talking about the portfolio when we calculate the portfolio risk with a +ve correlation coefficient we came up with a continuously increasing relationship between portfolio risk and return. So that model is similar to SML.

Risk vs. Return Graph (Risk Theory) 2-Stock Portfolio with Positive Correlation Coefficient



Risk vs. Return Graph (SML- CAPM) EFFICIENT MARKETS WITH FULLY DIVERSIFIED PORTFOLIOS AND EFFICIENTLY PRICED STOCKS



Security Market Line (SML):

It is a Straight Line Model for Beta Risk and Required Return. It is Similar to the Relationship for the 2-Stock Portfolio with $\rho > 0$. Beta Risk is Directly Proportional to Required Return. The Investors require an extra Return which exactly compensates them for the extra Risk of the Stock relative to the Market.

SML Linear Equation for the Required Return of any Stock A:

$$r_A = r_{RF} + (r_M - r_{RF}) \beta_A$$

In the above equation

r_A = Return that Investors Require from Investment in Stock A.

r_{RF} = Risk Free Rate of Return (ie. T-Bill ROR).

r_M = Return that Investors Require from Investment in an Average Stock (or the Market Portfolio of All Stocks where $\beta_M = + 1.0$ always). β_A = Beta for Stock A. $(r_M - r_{RF})$

β_A = Risk Premium or Additional Return in Excess of Risk Free ROR to compensate the Investor for the additional Risk.

STOCK BETAS & RISK, SML & RETURN AND STOCK PRICES IN EFFICIENT MARKS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics.

- **Stock Betas and Risk**
- **SML & Required Returns (CAPM)**
- **Stock Prices in Efficient Markets**

In the previous lecture, we have mentioned that the risk that is relevant in efficient markets where the investors are sensible and rational is the market risk. This is because rational investors maintain many stocks and they maintain diversified portfolio which contain stocks from different sectors and they manage to eliminate their diversifiable risk and the only risk they faced is the market component of the risk. However, this market component can not be eliminated and it will remain because markets do fluctuate. Fluctuation in the Market Index (KSE 100 index) is a measure of Market Risk. This fluctuation is caused by macro economic and socio political factors. Rational Investors in Efficient Markets eliminate the Random Company-Specific Risk through Portfolio Diversification. So, in Efficient Market the only Risk that remains is Market Risk. And so, the Price of Efficient Stocks is based on Market Risk only. But the CAPM based on the fundamental principal that the rate of return for the stock is directly proportional to the risk premium and the risk premium dependent on market risk alone and not the total risk. Before going into details of SML we first go through the remaining topics related to beta and its theoretical calculation based on standard deviation and covariance. We have mentioned that beta of the stocks have tendency of stock to move with the market. It is experimentally possible to calculate beta of the stock by monitoring the price or rate of return of the stock and at the same time monitoring the market index in the same period of time & comparing that how the changes in the stock market price relate to the changes in the stock market index. If you plot them on the graph where you have expected return for stock on Y- axis and expected return from the stock market index slope of the line from these points represent the beta

Stock Beta measures the Risk of a Stock Relative to the market.

Beta Stock A = $\% \Delta r_A^* / \% \Delta r_M^*$ = Slope of Regression Line. Regression Line uses Experimental Data.

The formula that relates beta of the stock to the standard deviation is as follows

Beta Stock A = Covariance of Stock A with Market / Variance of Market

$$= \sigma_A \sigma_M \rho_{AM} / \sigma^2_M$$

(Covariance Formula based on Probability & Statistical Portfolio Theory) Links Stock Beta (Market Portion of Risk) to Stock Standard Deviation (Total Single Stock Risk).

Simplified formula:

$$= \sigma_A \rho_{AM} / \sigma_M = \text{market risk}$$

Theoretical Beta – Example:

Suppose you have Analyzed the Historical Time Data for (1) Movements of the Price (or Return) of a Stock A and (2) Movements in the Value of the Stock Index.

You then Apply Simple Probability Formulas to compute the following Standard Deviations:

$$\sigma_A = 30\% \text{ (Stock A's Total Risk or Standard Deviation)}$$

$$\sigma_M = 20\% \text{ (Stock Market Index Standard Deviation or Risk)}$$

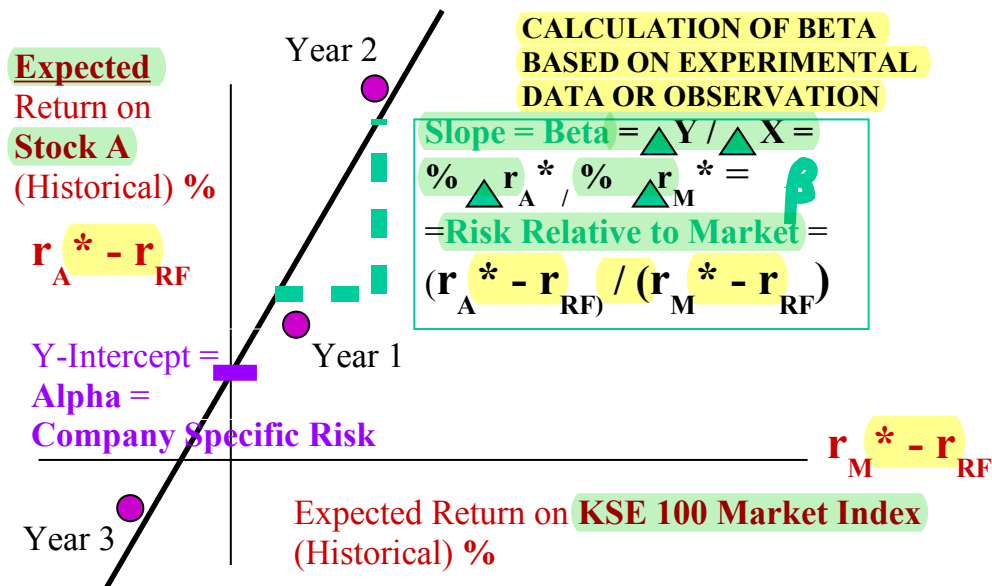
$$\rho_{AM} = +0.8 \text{ (Correlation between Stock A and the Market Index)}$$

Compute the Theoretical Beta of Stock A:

$$\text{Stock A Beta} = 30\% (0.8) / 20\% = 24\% / 20\% = 1.2$$

Calculating Stock Beta Graphically

Linear Regression through Annual Data Points for 3 Years.



The beta of 1.2 shows that stock is relatively more risky than the market and if the market moves up by 10% this stock will move up by 12%.

If all the points of the stock lie on the straight line then stock does not have any diversifiable risk. The difference between the actual data point and the point which vertically lies above or below the point is representative of the error which is representative of the company's risk attached to any stock.

Now we can put together the two concepts which we studied up till now that is company's specific risk and the second concept of regression line and the distance between data line and actual point of the company's risk. Now, we can come up with the total definition of total risk variances.

Total variance risk formula:

Total Risk of Stock A in terms of Variance (= Std Dev ²)

Total Risk = **Market Risk** + Random Specific Unique Risk

$$\sigma^2_A = \beta^2_A \sigma^2_M + \sigma^2_{A-\text{Error}}$$

Visualizing the Variance Risk Formula on the Regression Line

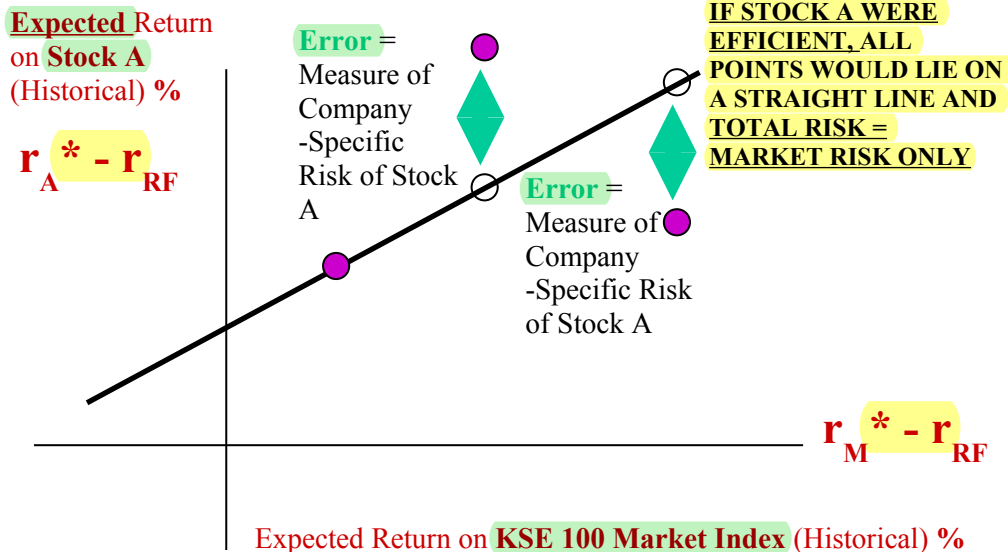
If a Stock is Part of a Totally Diversified Portfolio then its Company Risk = 0. Therefore Total Risk = Market Risk. And the Stock points will lie exactly on the Regression line.

If a Stock is a Single Investment then it carries Company Specific or Diversifiable or Random Risk.

This means that its points will not lie on the Regression line. The extent to which the points are scattered away is a measure of the Variance Error Term (last term in the formula)

How Efficiently Priced is Stock A?

Regression (Beta) Line for Stock A



Variance Risks – Example:

If the Market Risk = 20% and Stock A's Beta = 1.5 then what is the Relevant Market Risk Component of Stock A?

Stock A's Market Variance = Beta A² x Market Variance = 1.5² x (20%)² = 2.25 x 400% = 900% (Variance)

So the Stock A's Market Risk (in Standard Deviation terms) = Square Root of Variance = 30% = Beta A σ_M

Note that Total Risk of Stock A can be calculated directly by calculating the Standard Deviation of the Possible Future Returns. That was the first Risk Formula we studied in Risk Theory.

Suppose Total Risk = 35%. Then Company Specific or Diversifiable or Random Risk of Stock A = Total Risk - Market Risk = 35% - 30% = 5%.

So 86% (= 30/35 x 100) of Stock A's Total Risk is Market Risk - quite likely that Stock A is Part of a well Diversified Portfolio or Mutual Fund.

Security Market Line (SML) :

Straight Line Model is for Beta Risk and Required Return. Similar to the Relationship for the 2-Stock Portfolio with Ro>0 Beta Risk is Directly Proportional to Required Return. The Investors require an extra Return which exactly compensates them for the extra Risk of the Stock relative to the Market. SML Linear Equation for the Required Return of any Stock A:

$$r_A = r_{RF} + (r_M - r_{RF}) \beta_A$$

In the above formula

r_A = Return that Investors Require from Investment in Stock A.

r_{RF} = Risk Free Rate of Return (i.e. T-Bill ROR).

r_M = Return that Investors Require from Investment in an Average Stock (or the Market Portfolio of All Stocks where $\beta_M = +1.0$ always).

β_A = Beta for Stock A. $(r_M - r_{RF}) \beta_A$ = Risk Premium or Additional Return Required in Excess of Risk Free ROR to compensate the Investor for the Additional Market Risk of the Stock

Required Rate of Return, Risk Premium & Market Risk:

SML Model for Efficient Markets establishes a Straight Line relationship (or Direct Proportionality) between a Stock's Required ROR and its Risk Premium.

$$r_A = r_{RF} + (r_M - r_{RF}) \beta_A$$

A Stock's Risk Premium depends on its Market Risk Portion (and not the Total Risk)

In Efficient Markets, Market Price of a Stock is based on Required Return which depends on Risk Premium which depends on Stock's Market Risk Component (and not the Total Risk).

Stock Prices in Efficient Markets:

A Single Stock Investor who owns No Stocks and wants to buy a Share A will have to face more Risk (Market Risk + Specific Risk) than a Rational Fully Diversified Investor. The Single Stock Investor will want to buy the Stock at a lower price to compensate him for the higher risk. However, Efficient Markets do not price stocks based on Single Stock Investors who want compensation for taking on Unnecessary Company-Specific Risk which they should have diversified away.

Efficient Markets price the Stocks based on their Market Risk Component only. So, Efficient Stock Prices are based on Rational Investors holding Diversified Portfolios of many stocks.

SML - Numerical Example:

Calculate the Required Rate of Return for Stock A given the following data:

$\beta_A = 2.0$ (i.e. Stock A is Twice as Risky as the Market)

$r_M = 20\%$ pa (i.e. Market ROR or ROR on a Portfolio consisting of All Stocks or ROR on the "Average Stock")

$r_{RF} = 10\%$ pa (i.e. T-Bill ROR)

SML Equation (assumes Efficient Stock Pricing, Risk, and Return)

$$r_A = r_{RF} + (r_M - r_{RF}) \beta_A$$

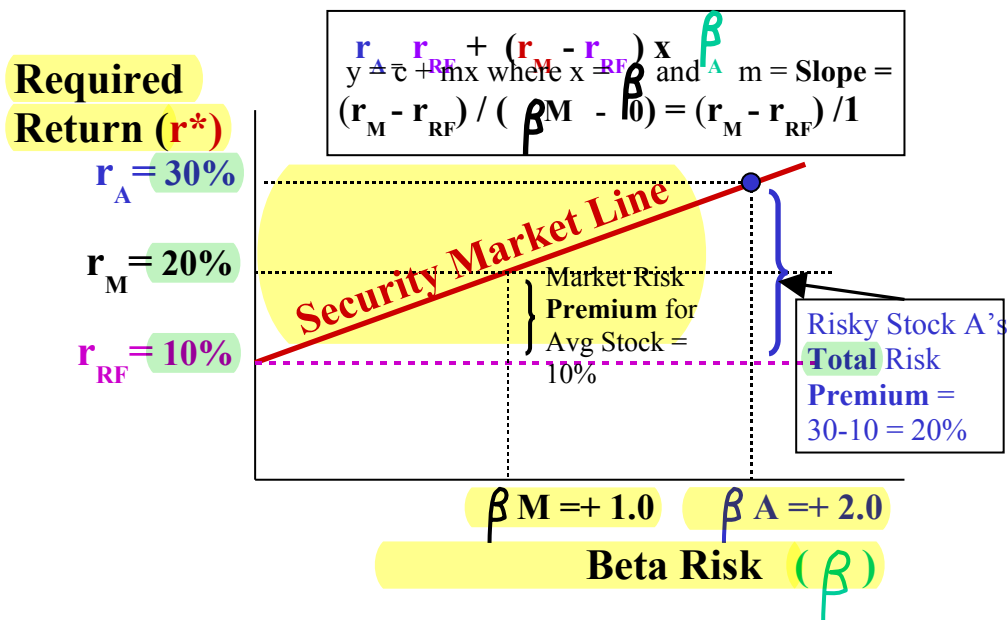
$$= 10\% + (20\% - 10\%) (2.0) = 30\%$$

Interpretation of Result:

Investors require a 30% pa Return from Investment in Stock A. This is higher than the Market ROR because the Stock (Beta = 2.0) is Riskier than the Market (Beta = 1.0 always).

If Required Return (30%) is higher than Expected Return (20%) it means that Stock A is Unlikely to Achieve the Investors' Requirement and Investors will NOT invest in Stock A.

Security Market Line (SML) For Market of Efficient Stocks



SML GRAPH AND CAPITAL ASSET PRICING MODEL**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics.

- SML Graph & CAPM**

We will continue our discussion on risk. It is very important in our daily life. We are always concerned with risky situation. There is risk that you can not watch this lecture due to the power failure. We have to know that how we can measure and control the risk in every day life. We are going to see that how we can use required rate of return that we calculated by using the SML equation and use that required rate of return for the calculation we have been doing in the first two parts of this course. In first part we did capital budgeting and NPV calculations and in the NPV formula the 'r' we are using is the required rate of return not the expected rate of return. We can use the value of required return from SML equation in stock or bond pricing. We have studied that in the efficient markets the required rate of return is come from the market return. There are two methods for the calculation of risk.

First approach the experimental cost base in this approach we use expected rate of return and market index. Then we plot these points on the graph and we join them with a straight line called regression line and slope of this line is called beta co-efficient.

The second approach for its calculation is called theoretical beta of stock:

$$\begin{aligned}\text{Beta Stock A} &= \sigma_A \sigma_M \rho_{AM} / \sigma_M^2 \\ &= \sigma_A \rho_{AM} / \sigma_M\end{aligned}$$

Extent to which Actual Stock Return Data lies on Regression Line

Total Risk = Market Risk + Random Company Specific Risk If the experimental data points

All lies exactly on the regression line then this particular stock has only market risk.

Theoretical Market Risk of a Stock:

$$\text{Market Risk of Stock A} = \beta_A \sigma_M = \sigma_A \rho_{AM}$$

Extent to which Actual Stock Return Data lies on Regression Line

The third formula which we discussed is very important and cornerstone of the CAPM.

Security Market Line (SML) and Required Rate of Return (r_A):

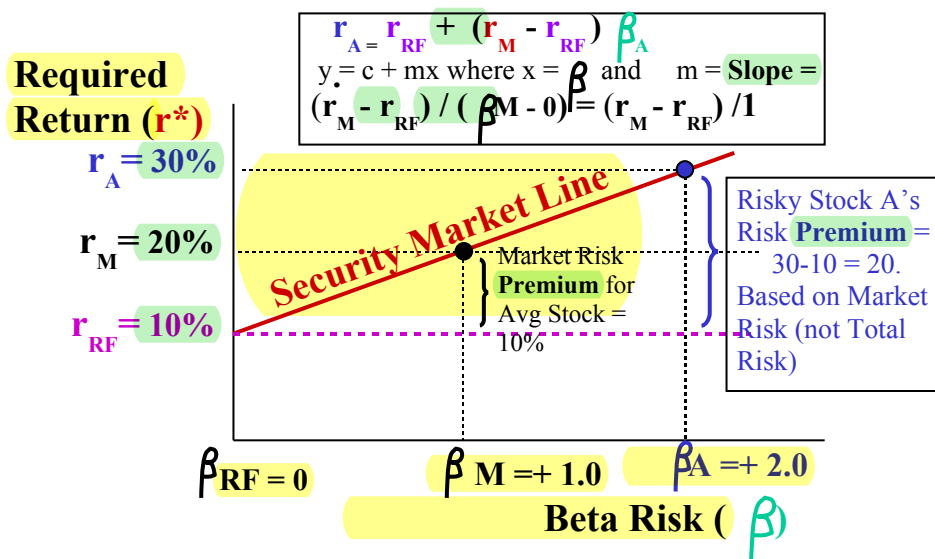
It allows us that the value which we have calculated for the beta and from that calculate the required rate of return of the stock and then we use for stock pricing. So, then the required rate of return for any stock A is equal to

$$r_A = r_{RF} + (r_M - r_{RF}) \beta_A$$

In Efficient Markets, Stock Price (and Value) depends on Required Return which depends on Market Risk (not the Total Risk).

The required rate of return in efficient markets depends upon the risk premium which depends only upon the market risk and not on the total risk. We do not have to worry about company's risk because we assume that investors are rational and maintain diversified portfolio. Now, let's take a look at the security market line graphically. It is important to understand this graph and many things that it tells us.

Security Market Line (SML) For Efficient Stocks



The graph represents the SML in the efficient stock market. On y-axis we have required rate of return r^* for the stock A for and risk free rate of return and on the x-axis is beta risk which represents the market risk. SML is straight line and it tells us the relationship between the market risk and the required return. It starts on the left hand side from risk free rate of return and it passes through a point in the middle which is the overall market point. This point is located at the beta of +1.0 and at the required return of 20%. This means that the market offers a rate of return which is higher than the risk free rate of return. Because the market fluctuates it has a risk of 1.0 and not 0. If we extend the line it passes through the point where the beta is +2.0 and the required return is 30%. Because this point lies on the SML it means that stock A has no company risk & what is the risk premium?

Risk premium = $r_A - r_{RF} = 30\% - 10\% = 20\%$.

It is directly proportion to market risk of stock.

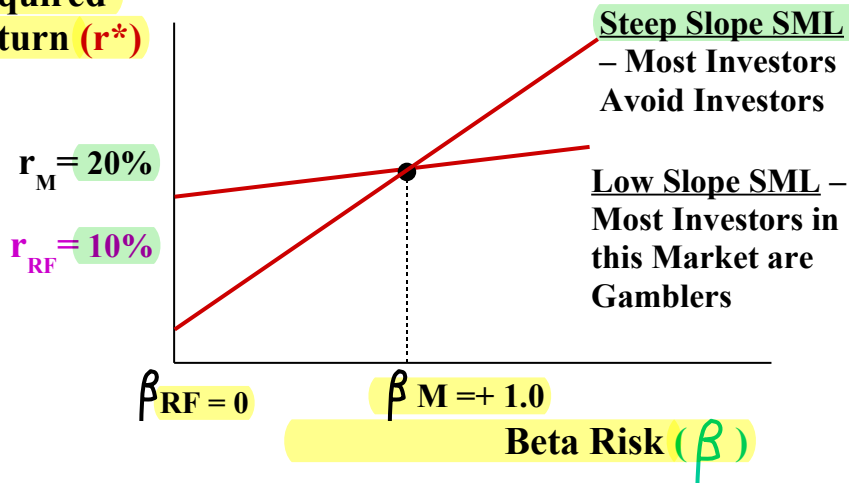
Please note that slope of this line is $= (r_M - r_{RF}) / (\beta_M - 0) = (r_M - r_{RF}) / 1$. This is the measure tendency of the average investors in the market to take risk. If the SML line is steeper the investors will not take unnecessary risk. In other words they are risk averse as the slope increase the avoidance for the risk also increases in the market as whole. It is very important to formulate the equation for SML. You should be able to understand the various points that lie on the SML line including the risk free rate of return or T-BILL return as well as the market point and you should also understand that the slope of SML line is $= (r_M - r_{RF}) / (\beta_M - 0) = (r_M - r_{RF}) / 1$. Beta coefficient was the slope of the line for different graph that graph shows the stock rate of return on y-axis and market rate of return on x-axis. But over there we are not talking about the required rate of return we were talking about the expected rate of return so; do not confuse these two different graphs. SML exists for only the efficient markets or perfect capital markets. SML tells us in detail that rational investor will eliminate the company's specific risk and the total risk of the company will be equal to the market risk of the company. SML line is an ideal case and in efficient markets all the stocks lie on the SML line. If stock is not on SML then according to market equilibrium it will come back on SML. If any stock is not on SML then forces of market equilibrium will bring it on the security market line. If risk and return combination of any stock is above SML it means that it is offering the higher rate of return as compared to efficient stock. The people will rush to buy such stock when the demand will increase the return will decrease.

If any stock is lying below the SML line the price will come down it will offer as much potential as the efficient stock offers. The supply for such stock will increase and it will offer higher return in form of capital gain. So, the market forces will throw these points on the SML. Markets are not risk free. Markets index fluctuate. The investors expect that market return will be more than the average expected return.

Security Market Line (SML) Slope & Risk Taking

Required

Return (r^*)



Even Markets and Market Returns Fluctuate because of Macro Systematic Factors. So the Fully Diversified Market Portfolio consisting of all shares is NOT Risk Free. The Market has a Risk Premium over the Risk Free ROR. This Market Risk Premium represents 100% Market Risk and No Company-Specific or Diversifiable Risk. Efficient Stock combinations of Risk & Return in Efficient Market Equilibrium must lie ON the SML.

Any Stock whose (Risk, Return) Pair lies ABOVE THE SML is offering Excessive Return (above the Market). So, all rational investors will rush to Buy it. The present Price would Rise and the Return (as measured by Capital Gain Yield = $(P_n - P_0) / P_0$) would Fall until it comes back on SML. Any Stock whose (Risk, Return) Pair lies BELOW THE SML is offering a Return that is lower than the Market. So, Rational Investors will rush to sell it. The Stock Price would Fall and the Return would Rise until it comes back on the SML.

Now, we will calculate the required rate of return using GORDON FORMULA. So, we need to calculate required rate of return to understand the risk so, let's use SML formula for required rate of return by plugging it into the GORDON FORMULA. price valuation formula by GORDON:

Share A is being traded in the Karachi Stock Exchange (KSE) at a Market Price of Rs 12. You need to calculate the Expected Theoretical Fair Price of a Stock A before you can decide whether to buy it or not. Given the following Data:

DIV1 = Rs 2 (i.e. Forecasted Dividends in the upcoming year on a share of Face Value = Rs 10)

g = 10% pa (i.e. Forecasted Constant Growth Rate in Dividends)

$r_{RF} = 10\%$ pa (i.e. T-Bill Rate of Return or PLS Bank Account ROR)

$r_M = 20\%$ pa (i.e. The Karachi Stock Exchange's historical average ROR based on the value of the KSE 100 Index)

Beta of Stock A = 2.0 (i.e. Stock A has historically been twice as volatile or risky as the KSE 100 Index)

Use the Gordon-SML Equation to Estimate Fair Price of Stock A:

$$P_0^* = \text{DIV1} / [(r_{RF} + (r_M - r_{RF}) \cdot A) - g]$$

$$= 2 / [10\% + (20\% - 10\%) (2.0) - 10\%]$$

$$= 2 / [30\% - 10\%] = 2 / 20\% = \text{Rs } 10$$

The Required Rate of Return for Stock A was calculated to be 30% which is higher than the Market (20%). The Market is offering a 10% extra return as a Risk Premium because Stock A (Beta = 2.0) is twice as risky as the market (Beta = 1.0).

The Fair Price of Stock A (Rs 10) is LESS than the Market Price (Rs 12) which means that the Market Speculators have Overvalued Stock A and you should NOT buy it.

So, what does our answer mean? We see that expected fair price of the share is Rs.10 which is lower than the market price which is Rs.12. keep in mind that price for the share is imperfect market depends upon the investor psychology, speculation and gambling that is taking place in the stock market. so, when fair price is lower as in our example and market price is higher it means that the shares price or stock has been over valued and the rational investor will not purchase it. other thing to note is that we calculated share premium and required rate of return in our formula is 30%. it is higher than the over all market risk. because it is twice risky as the market beta $A=+2.0$. therefore it is giving extra return to the investors for the compensation.

NPV Calculations & Capital Budgeting:

Application of SML (CAPM):

In the beginning of this course while studying capital budgeting and investment criteria we used the NPV and PV formulas for calculating required rate of return and not for expected rate of return. Required rate of return is attached to the individual investors. we forecast our dividends and they are not true cash flows so we discount them to the present. we calculate the standard deviation for over all industry. **NPV (and PV) Calculation** which is the Heart of Investment Criteria and Capital Budgeting uses required return (and NOT Expected ROR). This is why Share Pricing also uses Required Rate of Return because Share Price was derived from the PV Equation for Dividend Cash Flows.

We can apply our Probabilistic Risk Analysis to Entire Companies or Real Projects or Assets and focus on the Volatility or Uncertainty of their Net Cash Flows. We can compare that to the Volatility of the Cash Flows of the Industry that the Company is a part of to come up with a Beta Coefficient for the Assets of a Company as a whole. We can then use the Asset Beta to calculate the Overall Required Rate of Return for a Company (i.e. All Assets - both Equity and Debt).

Risk & Return - Must Consider both:

In Perfect Markets and Efficient Markets where Rational Investors have Diversified Away ALL Company Specific Risk, Value (and Stock Price) depends on Required Return which depends on Market Risk (and not Total Risk). In most Real Markets where Investors are not fully Diversified, Total Risk is important. It can be calculated using the Sigma (Standard Deviation) Formulas, probabilities, and Expected Return. Total Risk and expected Return must both be considered in Comparing Investments. Market Risk and required return are related to one another in Efficient Markets according to the SML equation. Required Return depends on the Individual Investor's Psychological Risk Profile and Opportunity Cost of Capital.

Betas:

Stock Beta vs. Real Asset Beta

Objective in FM is to maximize stock holders' (or Owners') Wealth

Negative Side Effect - Treasury Managers of Listed Corporations in USA and Europe spend too much time manipulating Stock Prices.

Real Assets have Risky Revenue Cash Flows:

$$\text{Asset Beta} = \text{Revenue Beta} \times [1 + \text{PV (Fixed Costs)}/\text{PV (Assets)}]$$

A Stock's Beta or Risk Relative to the Market can change with time. If the Company's business operations or environment change, its responsiveness to the Market can alter i.e. if it buys another business, implements a Total Quality Management program, makes an R&D technological discovery, takes on Debt, etc.

Notes on Measuring Uncertainty

Standard Deviation vs. Beta

For Example, Oil Drilling Companies: possible to have High Standard Deviations in Forecasted Earnings and Returns but Low Betas or Stock Price volatility relative to Market

Volatility vs. Risk:

Seasonal or macro volatility in Earnings does NOT necessarily signify Risk BUT High Stock Price volatility does signify Risk.

RISK AND PORTFOLIO THEORY, CAPM, CRITICISM OF CAPM AND APPLICATION OF RISK THEORY

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics

- Risk, Portfolio Theory, CAPM
- Criticisms of CAPM
- Applications of Risk Theory

Today we will review some concepts about risk portfolio theory and capital asset pricing model. There is saying in English that fortune favours the brave.

Summary of Single Stock (Stand Alone) Risk & Return:

The first thing that we studied was how to calculate the expected rate of return or risk for a single stock that is what we call stand alone investment. Uncertainty comes along as we are not what is price of the stock will be at any time in future? Because of this uncertainty there are possible outcomes of such investment and we attach probability or their likely hood and we calculate a weighted average in order to come up with expected rate of return on the investment.

Expected Return Formula (Weighted Average of Many Possible Future Outcomes for Returns of that one Stock)

$$\langle r \rangle = \sum (p_i \times r_i) \text{ (where } p = \text{probability of future outcome and } r \text{ is the rate of return from that outcome)}$$

So, if there are three possible outcomes attached with it the formula will be

$$\langle r \rangle = P_A r_A + P_B r_B + P_C r_C$$

Where, p=possible outcomes. There is a probability distribution of such outcomes and this distribution is the measure of the spread or range of possible values or uncertainty. if we a look at the graph of the normal distribution curve then the width of the curve is the measure of the risk or uncertainty. We measure risk mostly by standard deviation.

Stand Alone Total Risk Formula (Standard Deviation or Spread of Distribution of Possible Future Returns)

$$\text{Sigma} = \sigma = \left(\sum (r_i - \langle r \rangle)^2 p_i \right)^{0.5} = (\text{Var})^{0.5}$$

This formula which represents the total risk of a single stock can be used for the portfolio of stocks.

Portfolio Risk & Return:

We then spoke about the collection of many stocks. Why do sensible people invest in many stocks the logic is very simple that do not put all your eggs in one basket. The experimental studies have shown that if some one has 40 different stocks or investments which are not correlated to each other then half of the risk can be eliminated. What kind of risk has been eliminated? This is the company's specific risk that has been eliminated because of company's random events in the life of the company. So, the diversification or investment in increasing number of stocks reduces the overall or total risk and even if you diversified in 7 uncorrelated stocks it is possible to reduce the large portion of the company's own risk .once you have known the return of the individual stock you have known about the portfolio stock in collection of investments. Expected rate of return for 3 stocks on a portfolio is:

Expected Portfolio Return Formula (Weighted Average of Returns of Stocks in the Portfolio)

$$r_p = r_A X_A + r_B X_B + r_C X_C + (\text{for a 3-Stock Portfolio})$$

Portfolio Risk Formula

$$\sigma_p = \sqrt{X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2(X_A X_B \sigma_A \sigma_B \rho_{AB})} \quad (2 \text{ Stocks})$$

If 2 stocks move in the same direction together then correlation coefficient is 1.0. if the exactly move in the opposite direction then the correlation coefficient -1.0 and if there is no relation between the movement of the stocks then the correlation coefficient is zero.

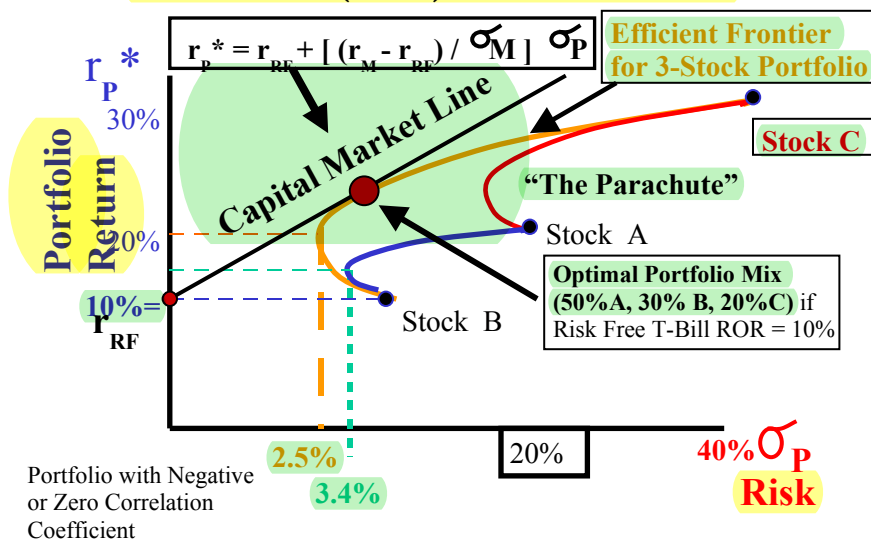
If More than 2 Stocks, then use RISK MATRIX

3-Stock Portfolio Risk Formula 3 x 3 Matrix Approach

	Stock A	Stock B	Stock C
Stock A	$X_A^2 \sigma_A^2$	$X_A X_B \sigma_A \sigma_B \rho_{AB}$	$X_A X_C \sigma_A \sigma_C \rho_{AC}$
Stock B	$X_B X_A \sigma_B \sigma_A \rho_{BA}$	$X_B^2 \sigma_B^2$	$X_B X_C \sigma_B \sigma_C \rho_{BC}$
Stock C	$X_C X_A \sigma_C \sigma_A \rho_{CA}$	$X_C X_B \sigma_C \sigma_B \rho_{CB}$	$X_C^2 \sigma_C^2$

The portfolio theory told us there is direct relationship between risk and the return and as risk of the investment goes up then return also increase. It is mentioned that if correlation co-efficient is less than or equal to zero (–ve) then the risk and return relationship between 2 stocks exhibits shaped curve what it tells us is that it is possible that when we added the 3rd stock then it not only increase the overall return but it also reduce the total risk of the portfolio and that is ideal. We found the parachute curve for the portfolio which consist of more than 2 stocks and this large hook is the efficient frontier which represents the most efficient combination of the different stocks in that portfolio. By adding stock C we came up with parachute curve and we also came up with curve that envelops both of these curves which is known as the efficient frontier. So, let's see how can we derive CML or the capital market line and the equation of CML from this efficient market curve. Portfolio return is with y-axis and risk along with x-axis we see the line from risk free rate of return which is assumed to be 10% and is represented by r_{RF} .

Picking the Most Efficient Portfolio Capital Market Line (CML) & T-Bill Portfolio



Parachute Graph and Efficient Frontier (Hook Shaped Curve) shows ALL possible Risk-Return Combinations for ALL combinations of stocks in the Portfolio – whether efficient or not.

CML Straight Line Equation (T-Bill Portfolio and Optimal Portfolio Mix on Efficient Frontier Curve) connects r_{RF} (Risk-free or T-Bill return) to the Tangent Point on the Efficient Frontier Curve.

It represents all Risk-Return Combinations for Efficient **Portfolios** in the Capital Market. We assume easy access to risk-free T-Bill Portfolio. Portfolio Risk measured using Standard Deviation. There is an optimal point of the line where

Stock A=50%
 Stock B=30%
 Stock C=20%

Summary of Beta:

Market Risk and Beta Coefficient (CAPM)

Single Stock Beta (=Slope of Best Fit Regression Line which passes through data points)

= Percent Change in Stock ROR / Percent Change in Market Index ROR

Portfolio Beta Risk Formula (Weighted Average Formula)

Stock Beta Formula in terms of Stock Standard Deviation & Covariance

$$= \sigma_A \sigma_M \rho_{AM} / \sigma^2_M$$

$$= \sigma_A \rho_{AM} / \sigma_M = \text{market risk}$$

Security Market Line (SML)

SML (Security Market Line) - Cornerstone of CAPM:

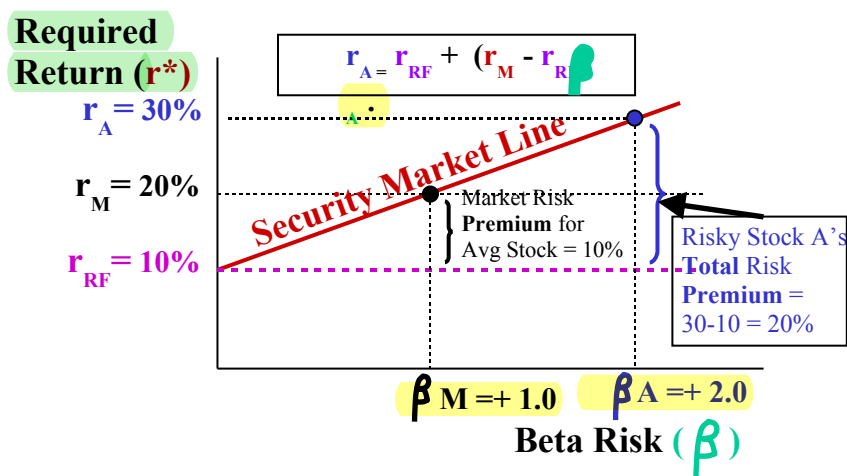
It represents all Risk-Return Combinations for **ALL Efficient Stocks** in the Capital Market. Stock risk measured using Beta. Market Price of a Stock is determined by Required Return on Stock which depends on Market Risk (not Total Risk). You can not expect to receive extra return (or compensation) for taking on Company-Specific Risk which Rational Investors have eliminated! Efficient Market Prices are based on Market Risk Only and NOT Total Risk.

The Efficient Market will only offer you a Return (and a Share Price) which is the bare minimum acceptable to rational diversified Investors.

Required ROR vs Expected ROR

SML Linear Equation & Graphical Interpretation

Security Market Line (SML) ALL Efficient Stocks in Efficient Markets



Criticisms of CAPM & Alternatives:

Weakness in SML:

- Not All Investors are rich or well-informed enough to hold Fully Diversified Portfolios therefore Market Risk (and Betas) is NOT the only relevant factor in estimating Required Return and Stock Prices. Other Efficient Market Assumptions.
- Taxes and Brokerage Costs that affect Investor's analysis and estimation of Returns have been ignored

Weakness in CML:

Not All Investors are influential enough to be able to Borrow at the T-Bill Rate. Generally the Borrowing Rate is higher than the Lending Rate.

Fama & French:

CAPM ignores 2 important determinants of Higher Required ROR (1) smaller firms and (2) Low Market-to-Book Ratio.

Arbitrage Pricing Model:

Accounts for several factors that affect risk i.e. Tax, inflation, oil price,...

Financial Management Applications of Risk-Return Theory (CAPM):

- **Practical Real Asset Investment Decisions and Capital Budgeting**
 - The most important NPV (and PV) Equations uses REQUIRED ROR (and NOT Expected ROR)
- **Actual Share Pricing** and Investment in Securities
 - **Gordon's Formula** for Share Pricing uses PV of Dividends which uses REQUIRED ROR

Risk & Return - Must Consider both:

In this course we have studied the following concepts of financial management.

- First Part of this Course - Valuation or Calculating NPV and PV which are measures of Return. We ignored Risk and origins of Required ROR.
- Second Part of this Course – Application of PV Concept to Valuation or Pricing of Bonds (Debt) and Shares (Equity). Again we ignored Risk and origins of Required ROR.
- Part 3 of the Course Introduced Risk and how it determines the Required Return used in NPV and Share Price Formulas.
- In Perfect Markets, Value depends on Required Return which depends on Market Risk (and not Total Risk).
- BUT, in Real Markets which are Imperfect and Inefficient, Total Risk is important. It can be calculated using the Sigma (Standard Deviation) Formulas, probabilities, and Expected Return.
- Total Risk and Expected Return must BOTH be considered in Comparing Investments.
- Market Risk and Required Return are Related to one another

Common Life Applications of Risk and Return Theory:

Concepts of Risk & Return Theory have Wide Practical Applications that require a Creative Mind.

Expected Value or Expected ROR or Expected Payoff

Total Risk or Standard Deviation (based on Spread or Range of Breadth of Possible ROR outcomes) = Unique + Market Risk

Systematic (or Market or No diversifiable) Risk (= Beta A x Sigma M). Individual Risk relative to Market or Industry.

- **Think Out of the Box:**

Social Cost-Benefit Analysis of Power Plant:

Environmental and Village Relocation Risk, Uncertain Savings

Court Case Payoff: Claims & Penalties

Uncertain likelihood of success and Opponent, Uncertain Payoff

Likelihood of War: Capability & Intent (Game Theory)

Magnitude of Capability vs Uncertainty of Intent

INTRODUCTION TO DEBT, EFFICIENT MARKETS AND COST OF CAPITAL**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **Intro to Debt, Efficient Markets & Cost of Capital**

In today's lecture, we will start our discussion on capital structure and corporate financing. The first thing which we study about the capital structure is the over view of the financial markets. We have mentioned that there are two main sources of capital raising i.e. debt and equity. There are various financial markets where the money is available.

Capital Markets:

Stock Exchange (listed shares, unit trusts, TFC):

In the case of capital market we have study the stock exchange where the common or preferred stocks of companies are traded. In these we have the supply or availability of the equity capital.

Money Markets (Short-term liquid debt market):

It is the market for short term debt. and it includes the debt instruments like term finance certificates and bonds etc. bank loans ,leases from leasing company , mortgage agreements from house building finance corporation insurance policy , credit cards and various other things .it also includes bank deposits certificates and inter bank short term and over night borrowing and lending Bonds

Real Assets Markets:

The real asset market where the real or tangible asset or physical asset change hand .for example, you have cotton exchange where raw bales of cotton change hands .computer hardware and many other examples are available. For example, Cotton Exchange, Gold Market, *Kapra* Market Property (land, house, apartment, warehouse) ,Computer hardware, Used Cars, Wheat, Sugar, Vegetables, etc.

Debt and Equity Markets:**Equity Markets and Institutions**

- Stock Exchanges
- Private Placements
- Private Equity Investments
- Venture Capital
- Islamic Finance

Debt Markets and Institutions

- Bond Markets
- Money Markets & Call Markets
- Bank Loans & Certificate of Deposits (CD's)
 - Project Financing
 - Running Finance or Working Capital Finance
 - Hypothecation and Pledge Financing for Inventory Purchase
 - Bridge Financing
- Mortgage Financing
- Lease Financing
- Insurance and Credit Card

In previous lectures we have studied about the efficient markets.

Efficient Markets" Assumption:

We assume that Financial Markets are quick and Prices are Right. There are Lots of Rational Investors in every Financial Market. They are all well-informed and act quickly on information related to the companies' operations, finances, risk and return. So Prices of Securities (like Stocks and Bonds) adjust (equilibrate) quickly to new information. Pricing by the Market is Efficient and Accurate. Observed Market Price is accurate reflection of Fair Price (or Theoretical Price based on Investors' NPV calculations).

All Stocks have Optimal Risk-Return Combinations, i.e. All Stocks lie right ON the SML Line!

Securities:

These are pieces of legal contractual paper that represent claim against assets

Direct Claim Securities:

Stocks: it is equity paper representing ownership, shareholding. Appears on Liabilities side of Balance Sheet

Bonds: it is debt paper representing loan or borrowing.

- **When you are issuing Bonds (i.e. borrowing money) then the Value of Bonds appears under Liabilities side (as Long Term Debt) of Balance Sheet.**
- **If you are Investing (or buying) Bonds of other companies then their Value appears under Assets side (as Marketable Securities) of Balance Sheet.**

Value of Direct Claim Security is directly tied to the value of the underlying Real Asset.

Why Take Debt?

If you do NOT have enough money to meet your own or your family's personal living expenses, then you approach a friend or a Bank for a Personal Loan.

If you can NOT find friends, family, or investors who want to invest Equity into your business venture, then you approach an Individual Lender or Bank or Leasing Company for a Business Loan. In an Emergency or Crisis, the quickest way to get money is generally to take a Loan at a high interest rate. Countries that are short of money do this too.

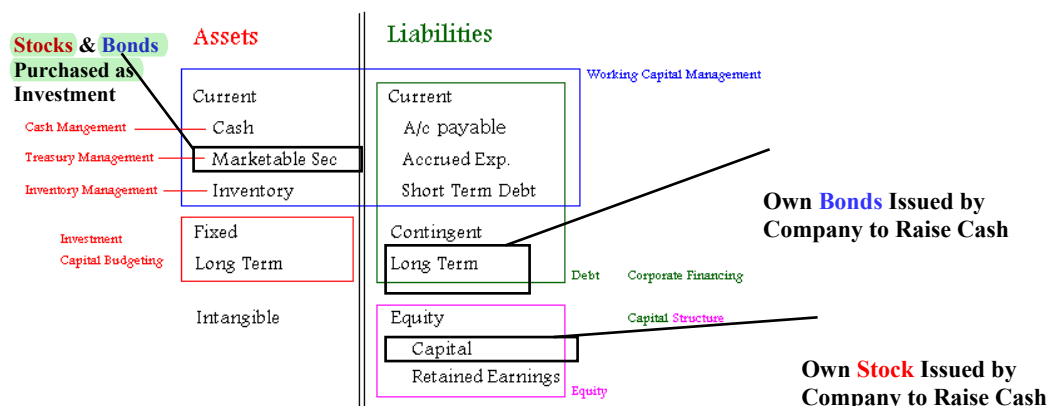
Debt vs. Equity:

If the Company raises money using Debt or Bonds, then it will have to pay a fixed amount of interest (or mark-up) regularly for a limited amount of time. Of course, failure to pay interest can force company to close down.

If the Company raises money using Equity, then it is forced to bring in new shareholders who are Owners & can interfere in the management and will get a share of the net profits (or dividends) for as long as the company is in operation

Where Do Bonds & Stocks Appear on the Balance Sheet?

Balance Sheet – an FM Perspective



Note: FM uses market value basis unlike Financial Accounting which generally uses historical basis.

Capital Structure:

Most Firms keep a Mix of Both Debt and Equity Capital. In other words most Firms raise money from both Stockholders (and Shareholders) and Bondholders (and Banks).

The Mixture or Proportion of Debt Capital and Equity Capital are known as the Capital Structure.

This Financial Policy Decision is taken by the CEO, CFO, and Board of Directors

Capital Structure can Change With Time depending on Firm's Financing needs and strategy. Some Projects like Power Plants and Cement are so Capital Intensive and large that initially the sponsors need Debt Capital When a Running Business reaches maturity, some owners prefer to fix the Ratio of Debt to Equity at 20/80 and only for Running Finance. Some Muslim Businessmen use 100% Equity Capital only (No Debt).

Cost of Capital: Firms try to attract Debt and Equity Investors to invest their Capital (or money). Firms claim that they are SAFE and PROFITABLE investments. Therefore, Firms try to Get Investment Capital (or money) at the LOWEST possible Cost of Capital.

Remember that whenever you Borrow or Rent or Buy anything (cycle, house, money), it Costs

You Money in the form of a Rental, Interest or Mark-up, Installment, etc.

Stockholders (Equity owners) expect to receive Dividends

Bondholders (Debt Holders and Banks) expect to receive Interest

Cost of Capital & Required ROR:

Required ROR (or Opportunity Cost) %:

CAPM Theory (SML for Efficient Markets) & NPV

Minimum ROR required attracting investor into buying a Security (i.e. Stock or Bond ...)

Opportunity Cost: Investor Sacrifices the ROR available from the 2nd best investment.

Cost of Capital %:

Weighted Average Cost of Capital (WACC)

Combined costs of all sources of financing used by Firm (i.e. Debt and Equity)

WACC is Similar to Required ROR BUT Takes into account some Practical Factors:

Taxes: Interest Payments are P/L Expenses and NOT Taxed.

Transaction costs: Brokerage, Underwriting, Legal, and Flotation Costs incurred when a Firm issues Stocks or Bond Securities

WACC

%Weighted Average Cost of Capital

Assume that Firm markets 3 Types of Financial Products (or Securities or Instruments) to attract Investors' Capital.

Bonds (Debt): Cost = Coupon Interest

Common Shares (Equity): Cost = Variable Dividend

Preferred Shares (Hybrid Equity): Cost = Fixed Dividend

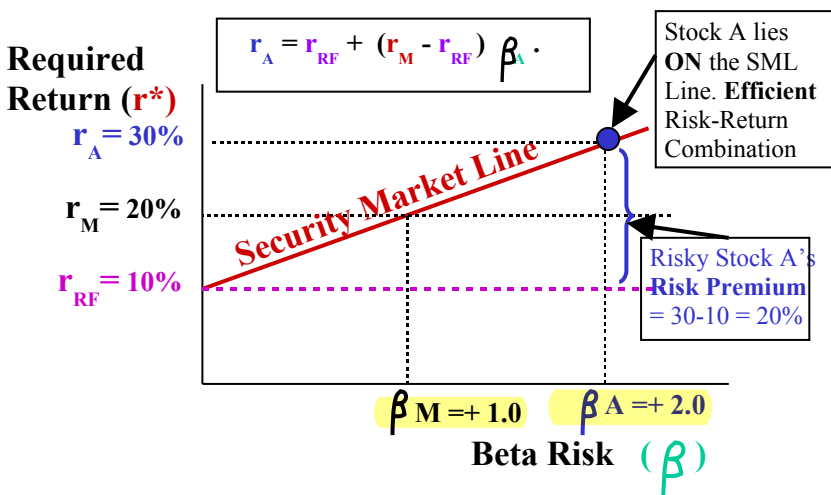
The Firm Issues a Security or Financial Instrument to the Investor and Receives Capital (or Money) in exchange. The Firm has to pay a “Rental Cost” for using the Investors' Capital.

WACC % = Weighted % Cost of Debt + Weighted % Cost of Common Equity + Weighted

% Cost of Preferred Equity = $r_D x_D + r_E x_E + r_P x_P$

WACC must take Taxes & Transaction Costs into account

Security Market Line (SML) For Market of Efficient Stocks



Summary of Formulas:

Total risk = market risk + company specific risk

$$\sigma^2 = \beta^2 \sigma_M^2 + \sigma_e^2$$

NPV Bond Pricing Equation:

Bond Price = PV = $C1 / (1+rD) + C2 / (1+rD)^2 + C3 / (1+rD)^3 + \dots + PAR / (1+rD)^3$

Gordon's Formula for Share Pricing:

$r_{CE} = (DIV_1 / P_0) + g$ = Dividend Yield + Capital Gains Yield

SML Equation (CAPM Theory)

$r = r_{RF} + \text{Beta} (r_M - r_{RF})$

WEIGHTED AVERAGE COST OF CAPITAL (WACC)**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics

- **WACC (Weighted Average Cost of Capital)**

In this lecture, we are going to talk about the very important component of capital structure which is known as weighted average cost of capital (WACC). In previous lecture, we have introduced some of the broad concepts of capital structure. We discuss about the company's ways to raise capital. One of two basic ways is the equity and the other is debt. The objective of the company is to raise capital at the lowest possible cost, just as when you go to the market you try to buy things at the lowest possible cost. Similarly, companies go looking for money in financial markets they try to raise funds at the lowest possible cost. This means that when the company raises money in the stock market issues that it try to sell its shares at the price at which it can earn maximum profit. Similarly, when a company goes to the money market to take loan it tries to get the loan at the lowest possible rate of interest.

We mentioned that weighted average cost of capital concept is similar to concept of the required rate of return which we have discussed in earlier lectures. It is also known as opportunity cost and by opportunity cost we mean "the rate of return that investors sacrifice by investing in the present investment". So, the rate of return that he can get from the second best of investment is the opportunity cost or ROR. We used the required rate of return in our present value formula. WACC is similar to the required rate of return. There is only slight difference between required rate of return and WACC. WACC only takes into account the practical aspects such as impact of taxes and transaction costs or flotation costs. By taxes we mean income tax or corporate tax that the company needs to pay to the govt. at the end of the year depending upon their net income and transaction associated with the issuing selling and marketing of the financial securities like stocks and bonds. When we talk about WACC, we generally include three possible types of capital.

$$\text{WACC} = r_D X_D + r_E X_E + r_P X_P$$

Weighted % Cost of Bond (Debt):

$$r_D X_D :$$

Where r_D is the Average Rational Investors' Required ROR for investing in the Bond, X_D is the Weight or Fraction of Total Capital value raised from Bonds = Bond Value / Total Capital

Weighted % Cost of Common Equity:

$$r_E X_E :$$

Where r_D is the Average Rational Investors' Required ROR for investing in Common Share, X_D is Weight or Fraction of Total Capital raised from Common Equity. Note that r_E is Not the WACC and Not the ROE (=NI / common stock)

Weighted % Cost of Preferred Equity

$$r_P X_P :$$

Where r_P is the Average Rational Investors' Required ROR for investing in Preferred Share, X_P is Weight or Fraction of Total Capital raised from Preferred Equity

$$\text{Weighted Cost of Debt \%} = r_D X_D$$

Required ROR for Debt

The first term is the r_D which is the required rate of return and the cost of debt can be interpreted as the required rate of return. You will recall that when we were talking about bond pricing that we also spoke about the over all return on a bond and that is referred to as yield to maturity or YTM.

YTM = interest yield + capital gain yield and it is representative of over all cost of debt in the form of bond.

$$\text{Cost of Debt Capital} = r_D$$

Practically speaking, Bonds are Issued (or sold) in the Market at a Premium (above Par Value) or Discount (below Par Value). And, the Issuance of Bonds has Transaction Costs. These transaction costs include Legal, Accounting, and Marketing and Sales fees. Both these are factored into the Market Price of the Bond used in PV Formula to calculate the Pre-Tax Cost of Debt Capital = r_{D^*} . So, rather than using Market Price of Debt, use the

$$\text{Net proceeds} = \text{Market Price} - \text{Transaction Costs}$$

Finally, Debt becomes less Costly because Additional Interest creates a new form of Tax Saving or Tax Shield.

$$\text{After Tax Cost of Debt} = r_D = r_{D^*} (1 - TC)$$

Where TC is the Marginal Corporate Tax Rate on the Net Income of the Firm

Example:

Company ABC issues a 2 Year Bond of Par Value Rs 1000 and a Coupon Rate of 10% pa (and annual coupon payments). Company ABC pays an Investment Bank Rs 50 per Bond to structure and market the bond. They decide to sell the Bond for Rs 950 (i.e. At a Discount). At the end of the first year, Company ABC's Income Statement shows the Coupon Interest paid to Bondholders as an expense. Interest represents a Tax Saving or Shield. Based on the Net Income and Industry Standard, the Marginal Corporate Tax Rate is 30% of Net Income. Assuming that the 2 Year Bond represents the ONLY form of Capital, calculate the After-Tax Weighted Average Cost of Capital (**WACC**) % for Company ABC.

Step 1:

Calculate Required ROR using Bond Pricing or PV Formula

$$PV = 100 / (1+r^*) + 100 / (1+r^*)^2 + 1000 / (1+r^*)^2$$

$$= 100 / (1+r^*) + 1100 / (1+r^*)^2$$

$$= \text{Net Proceeds} = NP = \text{Market Price} - \text{Transaction Costs}$$

$$= 950 - 50 = \text{Rs } 900$$

Solve the Quadratic Equation for Pre-Tax Required ROR = r^*

Using the Quadratic Formula: $r^* = 16\%$ AND $r = -5\%$

This question is just to represent the concept through an example. The values i.e. 16% & -5% are assumed not exactly calculated.

Step 2:

Calculate After Tax Cost of Debt

$$r_D = r_{D^*} (1 - TC) = 0.16 (1 - 0.30) = 0.16 (0.70) = 11.2\%$$

Step 3:

Calculate Weighted Cost of Capital (WACC)

$$WACC = r_D X_D + r_P X_P + r_E X_E$$

$$= r_D X_D + 0 + 0$$

$$= 11.2 (1) = 11.2\%$$

Weighted Cost of Preferred Equity = $r_P X_P$

Required ROR for Preferred Equity

The important thing to remember is that we calculated the price by using the Perpetuity Formula for

Perpetual Investment & Constant Div

$$PV = \text{Present Price} = P_0 = \text{DIV}_1 / r$$

So, $r = \text{DIV}_1 / P_0$. If you use the Actual Observed Market Price for P_0 then $r =$ Required ROR.

Cost of Preferred Equity Capital = r_P

Practically speaking, the process of Legally Structuring, Printing, and Marketing Preferred Share Certificates costs money in the form of Flotation Costs (including Brokerage and Underwriting Fees). These Costs are factored directly into the PV or Observed Market Price.

$$PV = \text{Net Proceeds} = \text{Market Price} - \text{Flotation Costs}$$

Preferred Stock Dividends are paid out from Net Income After taxes. So they are not Tax Deductible (unlike Bond Interest Payments).

Example:

Company ABC wants to issue a Preferred Stock of Face Value Rs 10. The Board of Directors has agreed to fix the Annual Dividend at Rs 2 per share. The Lawyer's fee and Stock Brokers' Commissions will cost Rs 1 per share. The Preferred Share is floated at Face Value. What is the Cost of Capital to Company ABC for raising money through Preferred Stocks?

Use **Perpetuity Formula** to Compute the **Required ROR**

$$r = \text{DIV}_1 / P_0 = \text{Rs } 2 / \text{Rs } 10 = 20\%$$

Minor Change in **Perpetuity Formula** to Compute the **Cost of Preferred Equity Capital**

$$\text{Net Proceeds} = NP = \text{Price} - \text{Flotation Costs} = 10 - 1 = \text{Rs } 9$$

$$r = \text{DIV}_1 / NP = \text{Rs } 2 / \text{Rs } 9 = 22\%$$

Flotation Costs ADD TO COST of Company Issuing the Preferred Equity Capital

Weighted Cost of Common Equity = $r_E X_E$

Required ROR for Common Equity (or Shares): 2 Approaches

Dividend Growth Model: Gordon Formula (simplified PV Formula) for Perpetual Investment & Constant Growth in Dividends

$r = \text{DIV1} / P_0 + g$. If you use the Actual Observed Market Price for P_0 then $r =$ Required ROR. Now 2 Approaches for proceeding to calculate Cost of Capital:

CAPM (SML Equation) Assuming Efficient Markets

$r = r_{RF} + \text{Beta} (r_M - r_{RF})$. Advantage: does not rely on Dividend Forecast

Cost of Common Equity Capital = r_E

Most complex cost of capital to calculate

Required ROR on Common Equity NEITHER observable NOR certain unlike Bond Coupon Interest & Preferred Dividends both of which are fixed

Equity Capital can be raised in 2 Ways and Required ROR and Costs are different for each: (1) Retained Earnings and (2) Issue of New Common Stock. You can use r_E for New Stock or Retained Earnings (which is lower).

Common Stock Dividends are paid out from Net Income AFTER TAXES. So they are NOT Tax Deductible (unlike Bond Interest Payments).

Example:

Company ABC wants to issue more Common Stock of Face Value Rs 10. Next Year the Dividend is expected to be Rs 2 per share assuming a Dividend Growth Rate of 10% pa. The Lawyer's fee and Stock Brokers' Commissions will cost Rs 1 per share. Investors are confident about Company ABC so the Common Share is floated at a Market Price of Rs 16 (i.e. Premium of Rs 6).

If the Capital Structure of Company ABC is entirely Common Equity, then what is the Company's WACC? Use 2 Approaches and Compare the Results

Example - Cost of Common Equity Capital**Dividend Growth Model**

Step 1: Calculate Required ROR for Common Stock using Gordon's Formula (Perpetual Investment and Constant Growing Dividend):

Approach I: Retained Earnings Approach (use Market Price)

$$r = (\text{DIV1}/P_0) + g = 2/16 + 0.10 = 0.125 + 0.1 = 0.225 = 22.5\%$$

Approach II: New Stock Issuance Approach

$$\text{Net Proceeds} = \text{Flotation Price} - \text{Flotation Costs} = 16 - 1 = 15$$

$$r = (\text{DIV1}/NP) + g = 2/15 + 0.10 = 0.133 + 0.1 = 0.233 = 23.3\%$$

Cheaper for Company ABC to Raise Equity Capital through Retained Earnings than to incur costs of issuing New Equity

Problem: Which Cost to Pick?

Example - Cost of Common Equity Capital

CAPM Model (SML) Efficient Market

Given some additional data: T-Bill ROR = 10% pa. Market ROR = 20%. Beta for ABC Common Stock = 1.25

$$r = r_{RF} + \text{Beta} (r_M - r_{RF}) = 10\% + 1.25 (20\% - 10\%)$$

$$= 10\% + 12.5\% = 22.5\%$$

Same answer as Retained Earnings Approach in Dividends Growth Model. Advantage: Don't need to forecast dividends in CAPM Approach.

CAPM matches Dividends Model if No Flotation / Transaction Costs and Market is Efficient

Required ROR (or Opportunity Cost) %

CAPM Theory (SML for Efficient Markets) & NPV

Minimum ROR required to attract investor into buying a **Security** (i.e. Stock or Bond ...)

Opportunity Cost: Investor Sacrifices the ROR available from the 2nd best investment.

Cost of Capital %

Weighted Average Cost of Capital (WACC)

Combined costs of all sources of financing used by **Firm** (i.e. Debt and Equity)

Similar to Required ROR BUT Takes into account some Practical Factors:

TAXES:

Interest Payments are P/L Expenses and NOT Taxed.

TRANSACTION COSTS:

Brokerage, Underwriting, Legal, and Flotation Costs incurred when a Firm issues Stocks or Bond Securities

Summary of Formulas

Total risk = market risk + company specific risk

$$\sigma^2 + \beta^2 \sigma^2 + \sigma^2$$

NPV Bond Pricing Equation:

$$\text{Bond Price} = \text{PV} = C1 / (1+r_D) + C2 / (1+r_D)^2 + C3 / (1+r_D)^3 + \dots + \text{PAR} / (1+r_D)^3$$

Gordon's Formula for Share Pricing:

$$r_{CE} = (\text{DIV}_1 / P_0) + g = \text{Dividend Yield} + \text{Capital Gains Yield}$$

SML Equation (CAPM Theory)

$$r = r_{RF} + \text{Beta} (r_M - r_{RF})$$

BUSINESS RISK FACED BY FIRM, OPERATING LEVERAGE, BREAK EVEN POINT & RETURN ON EQUITY

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics

- **Business Risk faced by FIRM**
- **Operating Leverage (OL)**
- **Breakeven Point & ROE**

In this lecture, we are going to continue our discussion on weighted average cost of capital and we will begin our discussion on the concept of operating leverage. Both of these concepts are of the area which we have stated in the previous lecture called capital structure.

In capital structure we decide what the distribution of debt and equity should be in the firm and it is decided by the board of directors of the firm or company. The job of deciding what amount of debt and equity one has is difficult.

So, the first thing is to calculate the cost of capital. so, the company has the option that it may either go into money market or into the capital market to raise money either through debt or through equity. Now, you might think the equity the company might raise has no cost. We all know that when a company takes a loan it has to pay interest or mark up on it but often people think when it raise fund through equity in stock exchange then there is no cost attached to it because they are not paying any fixed rate of interest with regular intervals. but that is mistake because there is cost attached to it in form of required rate of return which your stock holder expects to receive that and if company does not pay that then the stock holder will sell their shares and the price of the share will go down. Therefore it is important to calculate the cost of equity.

Now, let's combine all the cost associated with the debt, preferred stock and equity and calculate the weighted average cost of capital (WACC) of company that raise capital in all three possible ways.

Example:

Suppose company ABC has equal amounts of debts, common stocks and preferred equity 1/3 each. In previous lecture, we calculated what the cost of debt was that was 11.2% then we calculated the cost of preferred equity that was 16.7% and we also calculated the cost of common equity which was 22.7% it was the most difficult part of the WACC calculation now, it is easy because we are to apply the % of three different forms of capital.

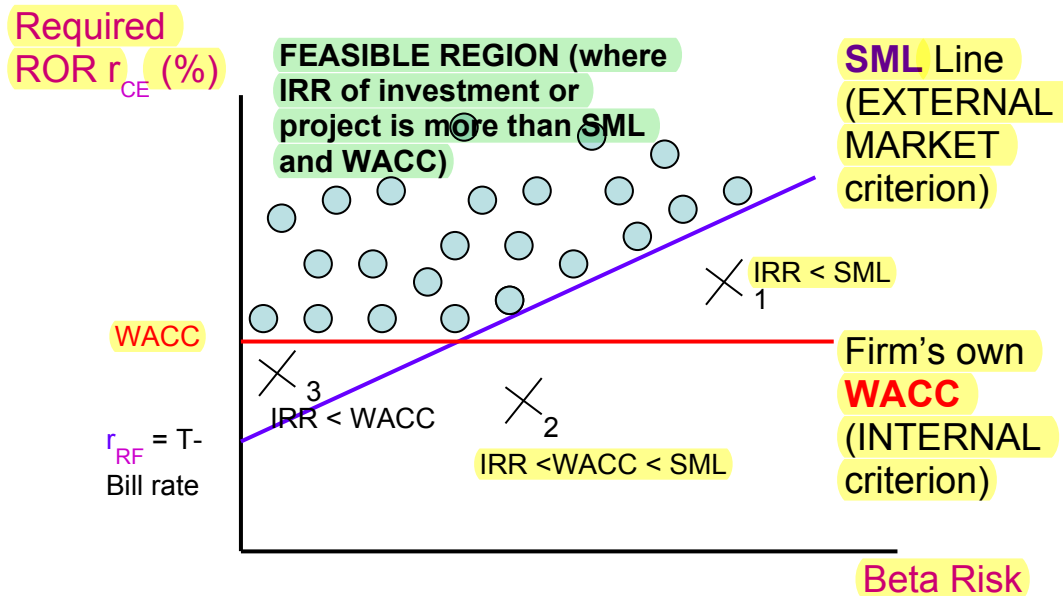
$$\begin{aligned} \text{WACC} &= r_D X_D + r_E X_E + r_P E_P \\ &= 11.2 \% (1/3) + 16.5 \% (1/3) + 22.7 \% (1/3) \\ &= 16.9\% \end{aligned}$$

Now, this is over all cost for a company. what does it mean? It means that it is the average cost that company has to bear in order to use the capital of investors. The cost of debt or bond, preferred equity and common stock this is the average of all three securities cost.

It means that the company should invest in a project where the rate of return is higher than 16.9% because it should be higher than the cost that it has to pay to the investors. Let's see the graph of weighted average cost of capital compared to the security market line we discussed in capital asset pricing model (CAPM).

It is important to understand this graph because it combines the market factors in the form of SML as well as the company's internal cost in the form of WACC. It shows that what combinations of the risk & return for a particular company to invest in or not.

SML – WACC Graph



The graph is a combine presentation of CAPM and WACC. It shows the expected return against the market risk or beta. In graph, the upward sloping line is SML and it is the requirement for bond and stocks in efficient markets where there are rational investors that are maintaining fully diversified portfolio and where knowledge spread very quickly through the markets. The risk and return combinations of all securities should lie on SML. The horizontal line is WACC which is fixed at 16.9% we have just calculated it. This represents required rate of return. In other words, if the company invests in any new project it should give a rate of return which is higher than 16.9%. You see that the only feasible reason where that company made investment is the area which I have shown filled up with dots and this is higher than the SML and WACC. I have also made three crosses which represent that why will not company invest in these areas? The first cross on right side X1 is showing rate of return which is higher than WACC but lower than SML. The company will not invest because it is not giving as much rate of return as efficient market is offering. The second cross X2 is lower than WACC and SML and cross three X3 is lower than WACC but it is on the SML again. The company will not invest in these two projects or regions.

It will invest only in dots regions on these two regions the cost is higher and the return is lower.

Debt vs **Equity**
from Firm's Point of View

Remember, that it is mentioned that generally speaking companies want to keep the balance both in form of debt and equity. We have also mentioned that debt has a risk attached with it because when we have to service the regular loan mark up or interest which will eat away your income and the result will be net loss. You know that in income statement we deduct certain financial charges. It may be due to many reasons because the company has to serve the debt. The other reason is that if the company do not pay interest it may close down so, then why do companies take debt?

Issuing Debt (or Leverage)

Advantages of Issuing Debt:

- Limited fixed Interest payment - no share in profits
- Limited Life
- Interest Payment is an Expense i.e. Tax Deductible
- Can Improve (or Amplify) the Return on Equity (ROE)

Disadvantages:

- Debt adds to Company-specific Risk
- If company doesn't pay Interest, it can be closed down

Issuing Equity (generally Common Equity or Ownership)

Advantages of Issuing Equity:

Not required to pay fixed regular Dividends

Capital Structure is a Firm's Mix of Debt & Equity

Risks Faced by Firm:

Total Stand-Alone Risk of a Stock (from Risk and CAPM Theory):

Stock's Total Stand Alone Risk = Diversifiable + Market

Company-specific Risk: Unique, Diversifiable

Market Risk: Systematic, Not Diversifiable

Total Stand-Alone Risk of a FIRM (New)

Firm's Total Stand Alone Risk = Business + Financial

Business Risk:

It is defined as the Risk of All Assets & Operations (without debt). Includes both Company-Specific (and Diversifiable) & Market Risks.

Financial Risk:

Additional Risk faced by Common Stockholders if Firm takes Debt. It is a pure debt-related Risk.

Financial Risk (Investor's Point of View):

Suppose firm ABC had a Capital Structure of 100% Common Equity. Then the Management and Board of Directors of firm ABC then decide to reduce half of the equity and take a loan (or Debt) instead. This affects the distribution of risk & return to the common equity holders (or Owners). In other words, the Management of firm ABC has added a new kind of investor. The debt holder faces almost no risk because he is "guaranteed" the Interest payment at all costs whether or not the firm is making profit or whether or not the equity owners are paid dividend. Debt holders eat away at the owners' (or equity holders') money at almost no risk. So, naturally, the risk faced by equity holders increases because same Business Risk is now shouldered by fewer Equity Shares. Risk per Share Increases. Generally Speaking, Increasing Debt Shifts More Risk Upon the Shareholders. Therefore required ROR demanded by the Common Equity Holder also increases (based on CAPM Theory).

Firm's Total Stand Alone Risk (Uncertainty in ROA & ROE):

Firm's Total Stand Alone Risk measured by the Uncertainty or Fluctuations in Possible outcomes for Firm's Future overall ROR.

If Business has Debt & Equity (i.e. levered firm):

Firm's Overall ROR = $\text{ROA} = \text{Return on Assets} = \text{Return to Investors} / \text{Assets} = (\text{Net Income} + \text{Interest}) / \text{Total Assets}$

Note: Total Assets = Total Liabilities = Debt + Equity

If Business is 100% Equity (or un-levered firm)

No Debt and No Interest.

Firm's Overall ROR = $\text{Net Income} / \text{Total Assets}$. For 100% Equity Firm, Total Assets = Equity. So Overall ROR = $\text{Net Income} / \text{Equity} = \text{ROE}$!

Note: Net Income is also called Earnings.

Note: ROE does not equal r_E (Required Rate of Return). ROE is Expected book return on Equity. Used in Stock Valuation Formula to calculate "g" & "PVGO"

Fluctuations in ROE = "Basic Business Risk"

You should review Financial Accounting Ratios for better understanding of the above mentioned concepts.

Basic Business Risk (Not Considering Debt):**Causes of High "Basic Business Risk" or Uncertainty or Volatility or "Instability" or "Shocks"**

Large changes in Customers' Demand (seasonality)

Unstable Selling Price (unstable markets and retailers)

Uncertainty in Input Costs (raw material, labor, utilities)

Inability of Management to Change Operational Tactics and Strategy to Meet Changing Environment

Ineffective Price Stabilization

Poor Product R&D and Planning

High Operating Leverage (OL)

Many other causes

Operating Leverage (OL):

Formula = Fixed Costs / Total Costs

Concept: High OL Increases Risk: Customer Demand Falls but Fixed Costs remain high. So, Small Decline in Sales Can Cause Large Decline in ROE.

Fixed Costs Across Different Industries:

Plant, Machinery, Equipment i.e. Power Plant, Cement, Steel, Textile Spinning
New Product Development, R&D Costs i.e. Pharma, Auto, IT
Highly Specialized & Skilled Workers i.e. IT

OL used in Capital Budgeting & Capital Structuring Decisions

Operating Leverage Application to Capital Budgeting

Example:

Comparing 2 Types of Technologies for Cement Manufacturing:

(1) Wet Process and (2) Dry Process. Different Total & Fixed Costs, Different OL.

Applications to Capital Budgeting

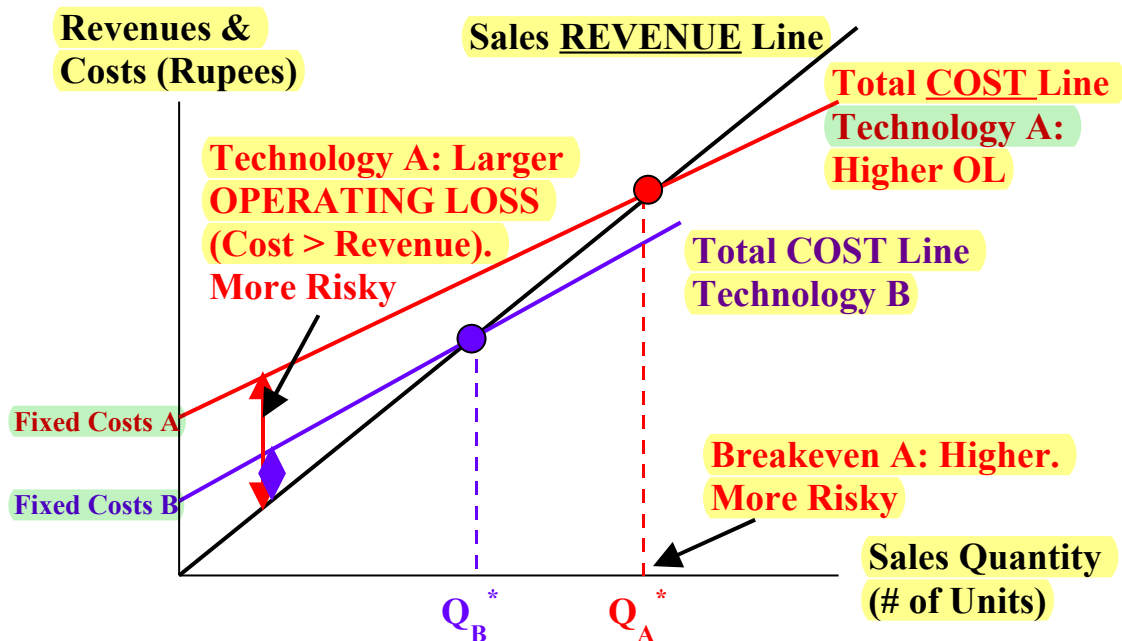
Different OL's, Different Breakeven Points, Different Risks,
Different Required ROR's

So, Different Discount Rates for 2 Technologies.

Affects Computation of NPV Investment Criterion

Break-even Point: Quantity of Sales at which EBIT = 0 therefore ROE = 0.
EBIT = Op Revenue - Op Costs = Op Revenue - Variable Costs - Fixed Costs = $PQ - VQ - F$. Where P= Product Price (Rs), Q= Quantity or # Units Sold, V= Variable Cost (Rs), F= Fixed Cost (Rs). So IF EBIT = 0 then $PQ - VQ - F = 0$ so Breakeven $Q = F / (P - V)$

Visualizing Operating Leverage (OL) Impact on Breakeven



Operating Leverage Application to Capital Structure

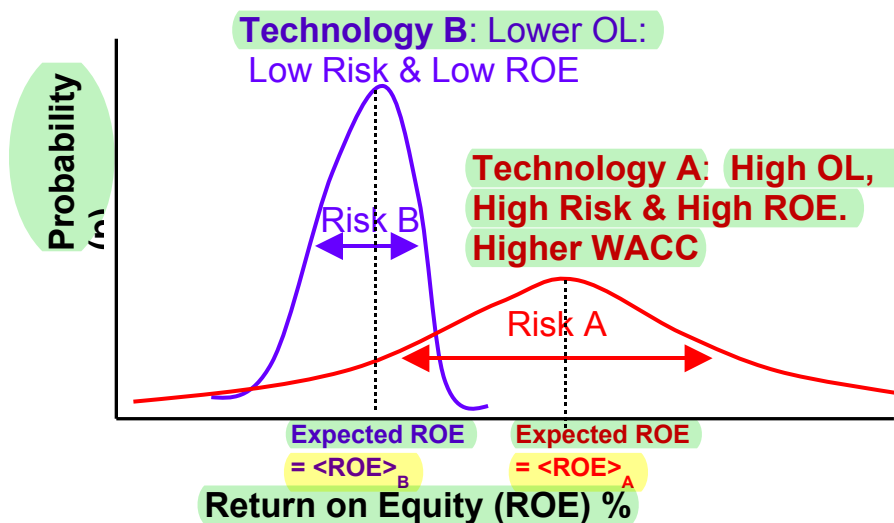
Applications to Capital Structure

Example of 2 Types of Cement Manufacturing Technologies: Different OL's has 2 Impacts:

Different Risks so Different Betas (CAPM Approach to Cost of Equity Capital), Different WACC's for 2 Technologies. Affects Choice of Capital Mix (or Capital Structure)

Different Fixed Costs, Different EBIT & NI, Different ROE's so Different Dividend Growth Rates "g," (Gordon-Dividends Approach to Cost of Equity Capital). So Different WACC's Affects Choice of Capital Mix.

Visualizing Operating Leverage (OL) Impact on ROE & Capital Structure



Now, let's talk in more detail about the operating leverage .in financial management the term leverage refers to the little change in the amount of sales or quantity of sale that will affect the over all earning of the company .

Operating leverage (OL) = $\frac{\text{FIXED COSTS}}{\text{TOTAL COSTS}}$

A company supposes has operating leverage of suppose 50% or 0.5 it is considered to a high leverage. Generally, it is more risky for a firm and the fixed cost does not change. So, the companies that has high leverage are considered to be more risky .Now, the companies have to hire the skilled people and technicians specially ,in the capital intensive industries .now, let's talk about the operating leverage .let's take the example of cement industry there are two ways of technology if you want to set a cement plant one is the old technology and the other is drying process new technology .these two types have different costs .we have learnt that NPV formula is best for investment decisions in which discount rate r is used which is the required rate of return .when OL associated with a firm is higher then the risk also becomes higher .we need to understand the impact of operating leverage both numerically ,and graphically .please go over the concepts of WACC and NPV.

OPERATING LEVERAGE, FINANCIAL LEVERAGE, ROE, BREAK EVEN POINT AND BUSINESS RISK

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics:

- **Operating Leverage**
- **Financial Leverage**
- **Concepts of Return on Equity, Break-Even Point and Business Risks**

In this lecture we will continue our discussion of capital structure and specifically we will discuss Operating Leverage, Financial Leverage and the concepts related to Return on Equity, Break-Even Points and Business Risks. In the last lecture we mentioned that total stand alone risk faced by a firm

= Business Risk + Financial Risk

Now, first we focus business risk then later we shall discuss financial risk.

Business Risk (from Operations except Debt):

Business risk stems from the operation and the assets of the firm. These may be caused by:

- Uncertainty & fluctuations in prices & costs.
- Specific business & Market Causes.
- Higher operating leverage ($OL = \text{Fixed Cost} / \text{Total Cost}$) that results in:
 - Higher breakeven point
 - Higher but riskier expected return on equity (ROE)

Application of Operating Leverage to Capital Budgeting:

Operating Leverage is the impact of a small change in the sales on the returns on equity. In other words small decline in sales can cause large decline in ROE (when sales are below breakeven point). Its formula is

Operating Leverage = Fixed Costs / Total Costs

High operating leverage increases risk due to higher percentage of fixed costs. There are many industries which are prone to high operating leverage. These are Capital Intensive Industries (i.e. Power Plant, Cement, Steel, and Textile Spinning), New Product Development, and Research & Development High Cost Industries (i.e. Pharma, Auto) and industries that need Highly Specialized & Skilled Workers (i.e. Information Technology, Software House, Semiconductor and Microprocessor, Manufacturers).

Now let us have a look at the sensitivity of Return on Equity to changes in sales. Recall from the previous lectures, ROE is a measure of overall return of a firm. In case of 100% equity firm the ROE is the measure of the overall return and any changes or variation in ROE is a measure of risk for that firm.

First concept that comes within Operating Leverage is Break-even. Break-even represents the quantity of sales at which operating revenues exactly cover operating costs. In other words the Breakeven Point is the point or quantity of sales at which Earnings before Interest and Taxes (EBIT) =

0. Now

$$EBIT = \text{Operating Revenue} - \text{Operating Costs}$$

Recall accounting concepts. Operating costs consists of fixed costs and variable costs. So

$$EBIT = \text{Operating Revenue} - \text{Variable Costs} - \text{Fixed Costs}$$

$$= (PQ) - (VQ) - F,$$

where

P= Product Price (Rs.),

Q= Quantity or Number of Units Sold of product,

V= Variable Cost of product per unit (Rs.),

Operating Revenue= Product Price multiplied by Number of Units Sold of product

Variable Costs= Variable Cost of product per unit multiplied by Number of Units Sold of product

F= Fixed Cost (Rs).

As at breakeven point

$$EBIT = 0$$

and we have just seen

$$EBIT = (PQ) - (VQ) - F$$

so

$$EBIT = (PQ) - (VQ) - F = 0.$$

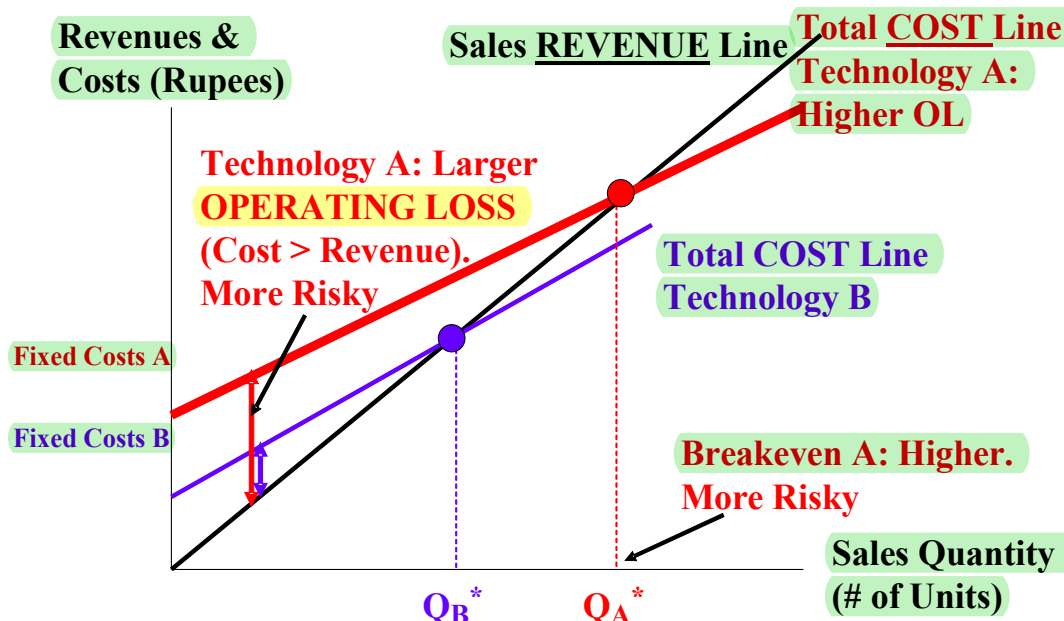
From this by solving equation we can derive

$$Q = F / (P - V).$$

This equation represents the minimum number of units the company must sell in order to cover its operating costs. We are discussing breakeven as changes in operating leverage will have an impact and change in breakeven quantity and also will have impact on the likelihood of the company making great losses. To understand the sensitivity and impact of small changes in sales on ROE, let us have look at a diagram:

Visualizing Operating Leverage (OL)

Impact on Breakeven Point & Capital Budgeting



Here operating leverage has been graphed. On the Y-axis we have the revenues and costs in rupees and on X-axis the sales quantity in number of units. Line passing through the origin represents sales revenue (PQ). Total cost line for two different technologies have also been drawn. Technology A total cost is represented by a line which is higher up showing higher operating leverage and the Technology B total cost line is lower with a high slope. Two important consequences to note from this graph are:

1- For Technology A fixed costs are high so it has higher operating leverage assuming lines shown on the graph are representatives of total costs of technologies. Impact of technology A with high operating leverage on EBIT is that technology A has larger operating loss as shown by the left hand side of the graph. This loss is due to higher total cost than the sales revenue. A company with higher operational leverage means it has higher % of fixed costs. Whether the company has high or low sales due to higher % of fixed costs it has high risks of operational losses. That's why companies, businesses, projects and technologies with higher operating leverages are perceived as more risky as they have more chances to incur operating losses due to their unavoidable high fixed costs. Higher operating leverage means greater reduction in EBIT as shown in graph.

2- As operating leverage increases breakeven point also increases i.e. breakeven shifts to the right. In other words, companies with high operating leverage require more units to be sold to cover their operating costs.

These are the two ways operating leverage affects the level of risk for a company. The above discussion of impact of operating leverage on capital budgeting indicate operating leverage affects EBIT. So, higher operating leverage means chances of falling ROE drastically are higher. Hence,

companies with higher operating leverage are more risky, their required rate of return is higher, discount rate in NPV formula is higher and NPV for these companies will be lower calculated for investment decision.

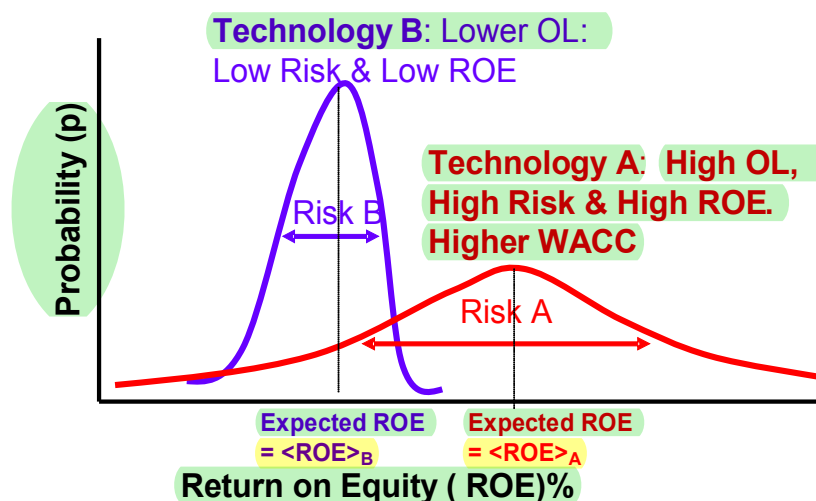
Operating Leverage Application to Capital Structure:

Operating leverage also affects Capital Structure. Companies and technologies with high operating leverage have higher risks that means they have

- Higher Betas (CAPM Approach to Cost of Equity Capital)
- Higher Weighted Average Cost of Capital
- Also higher average overall rate of return measured in terms of return on equity. This is possible in case of sales of companies are higher than breakeven point. In this case companies with higher operating leverages earn higher EBIT.

Therefore, overall impact of operating leverage must consider higher risk and higher return both provided by companies with high operating leverage. Have a look on the following graph to visualize the effect of Operating Leverage on risk and return of a particular technology:

Visualizing Operating Leverage (OL) Impact on ROE & Capital Structure



On the Y-axis we have the probability and on X-axis the ROE. There are two probability distributions. One on the left side is tall sharp peak probability distribution that represents technology B with lower Operating Leverage. It has lower risk and lower average ROE. Other on the right side is short and flatter that represents technology A with higher OL. It has high risk and higher average ROE. It also has higher WACC as it has higher required rate of return. Recall probability distribution and risk theory discussion that risks can be visualized as width or range of probability distributions curves. Shorter and flatter curve of A shows higher risk. Its average or mean ROE to that of right of B, shows higher ROE of A.

Now we come to the other component of a firm risk i.e. financial risk.

Financial Risk:

- Created when Firm takes Loan or Debt or issues Bonds – this is Financial Leverage

$$FL = \text{Debt} / \text{Total Assets}$$

- Increase in Risk faced by Common Stock Holders (or Equity Holders or Owners) when a Firm takes on more Debt or Financial Leverage.
- Increase in debt shifts more risk on common stock holders and risk per share increases.
- **Example:** Suppose a Firm ABC has Total Assets of Rs.1000 and is 100% Equity based (i.e. Un-levered). There were 10 equal Owners and 5 of them want to leave. So the Firm takes a

Bank Loan of Rs.500 (at 10%pa Mark-up) and pays back the Equity Capital to the 5 Owners who are leaving. Now, half of the Equity Capital has been replaced with a Loan from a Bank (i.e. Debt). What impact does this have on ROE?

- Assuming Business Risk is unchanged, and then risk per share rises because Equity is halved. So, more Risk is transferred to Common Shareholders.
- Debt Investors** (i.e. Lenders and Bond Holders) face minimal risk because
 - Guaranteed Regular Interest Income and
 - 1st Claim on Assets in event of Bankruptcy

Financial Leverage (Debt) Increases ROE Risk:

FL is the degree or extent to which a company's total capital is composed of debt. So a company with 80% debt is highly leveraged. Let us take an example of a company moving from 100% equity to 50% equity and 50% debt to see Impact of Financial Leverage (Loan) on Balance Sheet.

Impact of Financial Leverage (Loan) on Balance Sheet

Un-Levered Firm (100% Equity)		Levered Firm (50% Equity - 50% Debt)	
Assets	Liabilities	Assets	Liabilities
	Equity: 1000		Debt: 500
			Equity: 500
Total: 1000	Total: 1000	Total: 100	Total: 1000

Note: Total Assets = Total Liabilities = Debt + Equity

This table shows the capital structure of the firm under the conditions of leverage and no leverage. Under no leverage its Assets=Equity=1000. But after leverage it has 500 as debt and 500 as equity. It has converted 500 of equity into debt by taking loan.

- Increase in Debt increases chances of net loss if seasonal dip causes EBIT to fall below interest payment.
- Increase in Debt increases uncertainty in ROE. Range or Spread of Possible future values of ROE increases. Risk faced by Common Stock Holders Increases.

This can be illustrated by the following example:

Impact of Financial Leverage (Loan) on Income Statement & ROE

	Un-Levered (100% Equity)	Levered (50% Equity)
Expected EBIT	300	300
Interest (10% of 500)	0	50
EBT	300	250
Tax (30% of EBIT)	90	75
Net Income (NI)	210	175
Expected ROE (=NI/Equity)	210/1000= 21%	175/500=35%
Total Return	210	175+50=225

- Increase in Debt Improved or Leveraged Up the ROE to 35%
- Increase in Debt also Increased the Total Return to Investors = NI + Interest. Increased from Rs.210 to 225 (175+50)
- So, why not keep adding more Debt? Because, Debt has increased the risk i.e. The Standard Deviation or Uncertainty of ROE.
- Total Stand Alone Risk of Firm = Business Risk + Financial Risk
 - Total Stand Alone Risk = Standard Deviation of ROE of Levered Firm
 - Business Risk = Standard Deviation of ROE for Un-levered Firm

Financial Leverage (FL) & Operating Leverage (OL):

Effect of Financial Leverage & Operating Leverage on ROE is Similar:

- High Operating Leverage: High Fixed Costs so small changes in Quantity Sold cause larger changes in Net Income & ROE
 - Risky if Firm's Sales < Breakeven Point BUT
 - Multiplies Increase in Mean ROE when Sales > Breakeven
- High Financial Leverage: High Debt & Interest Payments so small changes in EBIT cause large changes in Net Income & ROE
 - Risky if Firm's Overall Return is low and can not pay Interest on time but
 - Multiplies Increase in Mean ROE and Total Return (to Equity & Debt Holders) when Firm's Overall Return is Higher than Cost of Debt

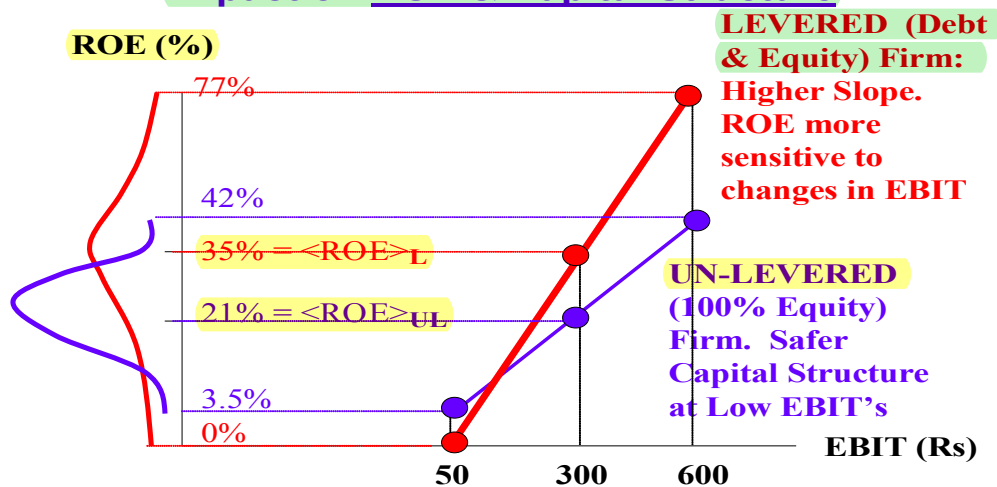
The impact of leverage debt on ROE can be visualized in a graph. For this purpose we need to consider the following table:

	EBIT	Interest (Rs.50)	EBT (30%)	Tax	Net Income	ROE (=NI/Equity)
Un-Levered Firm with no debt or 100% equity	600	0	600	180	420	42%
	300	0	300	90	210	21%
	50	0	50	15	35	3.5%
Levered firm with debt	600	50	550	165	385	77%
	300	50	250	75	175	35%
	50	50	0	0	0	0%

You see for a levered firm range of ROE is high from 0 to 77% for level of earnings from 50 to 600. For an unlevered firm this range is very short from 3.5% to 42% for same level of earnings. So for a company whose sales are low unlevered capital structure is safer than a levered one while for a company with healthy sales growth, levered capital structure provides an opportunity of high ROE.

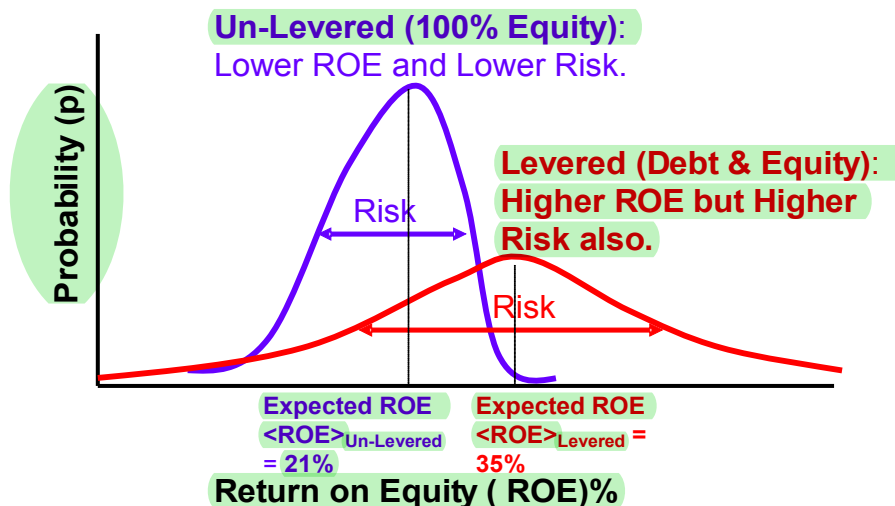
Visualizing Financial Leverage (FL)

Impact on ROE & Capital Structure



The impact of leverage debt on ROE can also be shown in a graph based on probability distributions:

Visualizing Impact of Financial Leverage on ROE & Capital Structure



On the Y-axis we have the probability and on X-axis the ROE. There are two probability distributions. One on the left side is tall sharp peak probability distribution that represents un levered firm. It has lower risk and lower average ROE. Other on the right side is short and flatter that represents levered firm with higher OL. It has high risk and higher average ROE. Recall probability distribution and risk theory discussion that risks can be visualized as width or range of probability distributions curves. We shall discuss these graphs and financial leverage in detail in next lecture.

FINANCIAL LEVERAGE AND CAPITAL STRUCTURE**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **Financial Leverage**
- **Capital Structure**

First we recap some concepts of previous lectures.

- $WACC \% = r_D X_D + r_E X_E + r_P X_P$. (Debt, Common Equity, Preferred Equity)
 - Where “r” is ACTUAL COST which can be calculated from REQUIRED ROR after accounting for Taxes & Transaction Costs.
 - Equity Capital: If Not Enough Retained Earnings then Equity Capital must be financed by New Stock Issuance which is more costly.
- Total Risk Faced by FIRM
= Business Risk + Financial Risk
- Higher Operating Leverage ($OL = \text{Fixed Costs} / \text{Total Costs}$)
 - Higher Mean ROE WHEN FIRM'S SALES > BREAK-EVEN POINT
 - Higher Fixed Costs means Higher Break-even Point and More Chances of Operating Loss. Risk of Large Drop in Return on Equity (ROE) so Higher Risk.

Financial Risk:

From the discussion of the previous lecture we can infer that

Financial Risk = Total Standalone Risk – Business Risk

For example, if

Total risk as measured by standard deviation of ROE of levered firm = 30%

and Business risk as measured by standard deviation of ROE of un-levered firm = 20%

then

Financial Risk = 30% - 20% = 10%

Financial Risk is created when firms take loan or debt. As companies take more debt they are exposed to more financial risk.

Financial Leverage (FL):

Financial Leverage shows the effect that small increase in EBIT can create much larger increase in ROE of the firm.

Financial Leverage (%) = $\text{Debt} / \text{Total Assets} = \text{Debt} / \text{Debt} + \text{Equity}$

If firm has Rs.1000 of total assets and Rs.500 debt then it has 50% (=500/1000) financial leverage. So this firm has 50% leverage means 50% equity and 50% debt. Practically, firms increase financial leverage by

- Issuing New Debt (i.e. Taking New Loans and Increase Debt)

OR

- Replacing Equity with New Debt (Increasing debt and increasing equity too)

Financial Leverage Impact on Risk & Return of Firm:

Financial Leverage (or Debt Financing) generally increases overall risk & return of a firm. Let us have a look now on a table that shows how when a firm becomes levered it increases the variability of ROE and how it increases the mean ROE.

Effect of Leverage on ROE Volatility & Risk

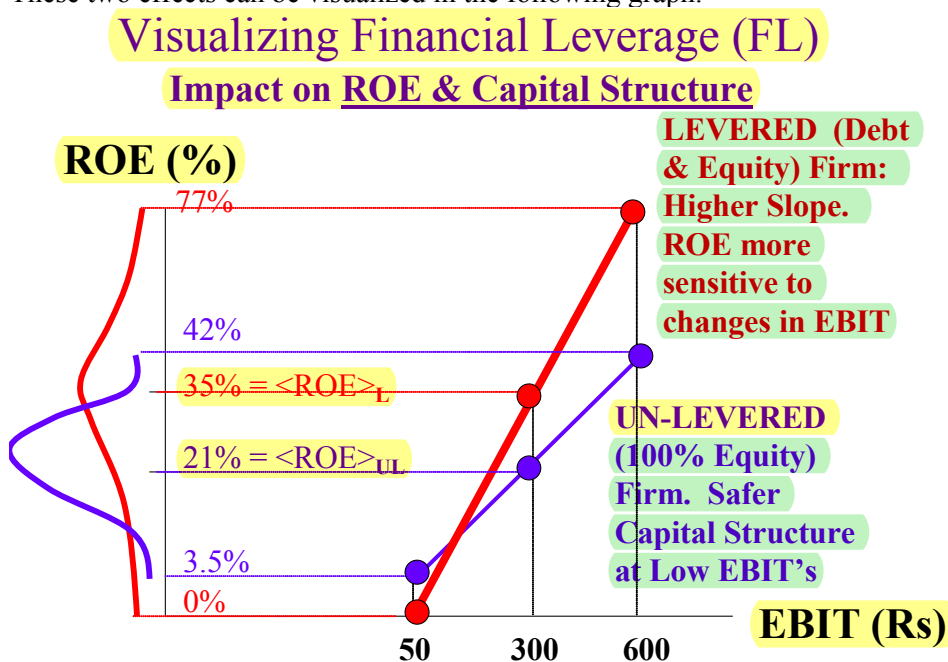
	EBIT	Interest (Rs.50)	EBT (30%)	Tax	Net Income	ROE (=NI/Equity)
Un-Levered	600	0	600	180	420	42%
Firm with	300	0	300	90	210	21%
no debt or 100% equity	50	0	50	15	35	3.5%
Levered firm	600	50	550	165	385	77%
with debt	300	50	250	75	175	35%

50 50 0 0 0 0%

This table shows the effect on ROE as earnings change from Rs.50 to Rs.600. This variation in earnings can be due to market forces or random events. This variation in sales revenue can lead to change in EBIT and this is source of risk. This will lead to change in possible values of ROE. Results of the table for levered and un-levered firm indicate that leverage (or Debt) increases the spread or range of possible ROE thereby increasing uncertainty and risk. Financial Leverage (or Debt Financing) generally increases overall risk & return of a firm due to the following reasons:

- Increases Return (Mean ROE):
 - When EBIT /Total Assets > Interest Cost then Financial Leverage is Good. Small Increase in EBIT can create much larger Increase in ROE. If EBIT /Total Assets > Interest Cost it means firm is generating profit by the use of its debt resulting in increased ROE as firm has positive cash flows.
 - If Equity (and number of shares) reduced then Return (NI) per Share Increases. By reducing its equity the firm will increase its percentage of debt in capital structure. As the earnings are the same to be distributed among lesser number of shares due to reduced equity the return will increase per share resulting in increased ROE.

These two effects can be visualized in the following graph:

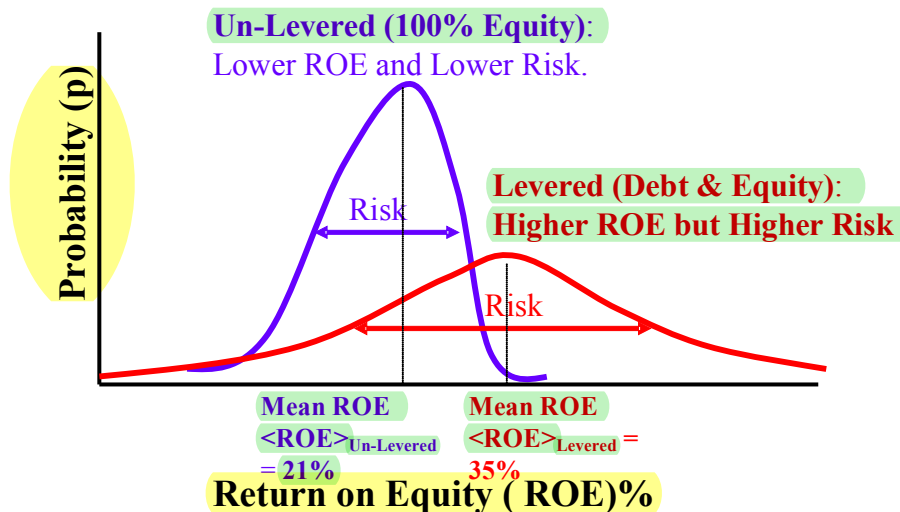


This is the graphic representation of the above table of Effect of Leverage on ROE Volatility & Risk for a levered and un levered firm. It indicates that leverage (or Debt) increases the spread or range of possible ROE thereby increasing uncertainty and risk. Range of possible values of ROE have been indicated by straight lines while level of risk by the probability distributions.

- Increases Risk (Standard Deviation in ROE):
 - Fixed Interest Dues so Higher Chances of Losses, No Dividends for Shareholders. Possibility of Large Drop in ROE. Possibly Default. More Risk Transferred to Stockholders.
 - If Equity (and number of shares) reduced then Risk per Share Increases.

This can also be visualized in the following graph:

Visualizing Impact of Financial Leverage on ROE & Capital Structure



Capital Structure Theory:

From the discussion of Financial leverage we know Financial Leverage ($FL = \text{Debt} / (\text{Debt} + \text{Equity})$)

- Increases Overall Return (Mean ROE) when $\text{EBIT}/\text{Total Assets} > \text{Interest (or Cost of Debt)}$ then Leverage is Good because small Increase in EBIT causes much LARGER Increase in ROE.
- Increases Overall RISK (Standard Deviation of ROE) of FIRM. Leverage will always MAGNIFY or AMPLIFY a small change in EBIT into a LARGER change in ROE.
- Fundamental Principle in Risk-Return: Rational Investors in Efficient Markets will only take Extra Risk if they are compensated by Sufficient Extra Return.
- Should the Management of a Firm undertake Financial Leverage? If so, then how much Debt should a Firm have?

– Answer provided by **Capital Structure Theory**.

Modigliani - Miller:

- Fathers of Corporate Finance
- “Cost of Capital, Corporate Finance and the Theory of Investment” Revolutionary Article Published by Professors Modigliani & Miller in American Economic Review in June 1958. Won Nobel Prize.

• “Pure M-M” (or Modigliani-Miller) Model - IDEAL CASE:

There is no fixed ratio for debt in capital structure. Generally it varies with each company’s needs and requirements. Capital structure theory tries to determine the most suitable ratio for a firm.

- Major Assumptions: No Taxes, No Bankruptcy Costs, Efficient Markets, Equal Information Available to All Investors
- Major Conclusions:
 - Capital Structure has no affect on value of a FIRM! Capital Structure is Irrelevant!
 - It does NOT matter how a firm finances its operations, how much debt it has because it has no bearing on a Firm’s Overall Value as calculated using NPV!
 - Corporate Financing & Capital Structure Decisions have no bearing on Investment (or Capital Budgeting) Decisions.
 - Capital Budgeting can be carried out without knowing the exact Capital Structure of a Firm - you can assume 100% Equity (Un-levered) Firm.

Keep in view these conclusions of the theory are correct only under the ideal conditions as assumed by Modigliani-Miller.

Modified MM - With Taxes:

In order to apply it in the real world for its use, some other economists made some modifications. In order to make this theory applicable in the real world and to account for the effects of corporate and personal taxes on investment decision and on firm, the effect of taxes was included in it.

- **Modigliani-Miller (With Corporate Tax)**

- In most countries, a Firm's Interest Payments to Bond Holders are NOT Taxed. But Dividend Payments to Equity Holders are taxed.
- Based on CORPORATE TAXES, FIRMS should prefer to raise Capital using DEBT Financing rather than equity as there is saving associated with capital raised through this source.

From firms point of view interest payments are source of tax savings.

- **Merton-Miller (With Personal Tax)**

- In most countries, INVESTORS (bondholders and shareholders) pay a higher Personal Income Tax on Interest Income from Bonds than on Dividend Income from Equity (or Stocks).
- Based on PERSONAL TAXES, INVESTORS should prefer to invest in STOCKS (or Equity).

Uncertain Conclusion: Difficult to determine Net Effect of taxes on optimal capital structure. But, practically speaking, Corporate Tax Effect is generally stronger so Based on Taxes alone, Firms should prefer Debt.

We shall discuss other modifications in Modigliani – Miller capital structure theory along with the one discussed above in the next lecture.

MODIFICATIONS IN MILLAR MODIGLIANI CAPITAL STRUCTURE THEORY**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic:

- **Modifications in Miller Modigliani Capital Structure Theory**

Modified MM - With Taxes:

In order to apply it in the real world for its use, Miller-Modigliani and some other economists made some modifications. In order to make this theory applicable in the real world and to account for the effects of corporate and personal taxes on investment decision and on firm, the effect of taxes was included in it.

- **Modigliani-Miller (With Corporate Tax)**
 - In most countries, a Firm's Interest Payments to Bond Holders are NOT Taxed. But Dividend Payments to Equity Holders are taxed. This was conclusion after study of different countries. Most of the firms prefer debt rather than equity.
 - Based on CORPORATE TAXES, FIRMS should prefer to raise Capital using DEBT Financing rather than equity as there is saving associated with capital raised through this source.

From firms point of view interest payments are source of tax savings.

- **Modigliani -Miller (With Personal Tax)**
 - In most countries, INVESTORS (bondholders and shareholders) pay a higher Personal Income Tax on Interest Income from Bonds than on Dividend Income from Equity (or Stocks).
 - Based on PERSONAL TAXES, INVESTORS should prefer to invest in STOCKS (or Equity).

Uncertain Conclusion: Difficult to determine Net Effect of taxes on optimal capital structure. Effects of corporate taxes and personal taxes are contradictory. But, practically speaking, Corporate Tax Effect is generally stronger so Based on Taxes alone, Firms should prefer Debt.

Modified MM - With Bankruptcy Cost:

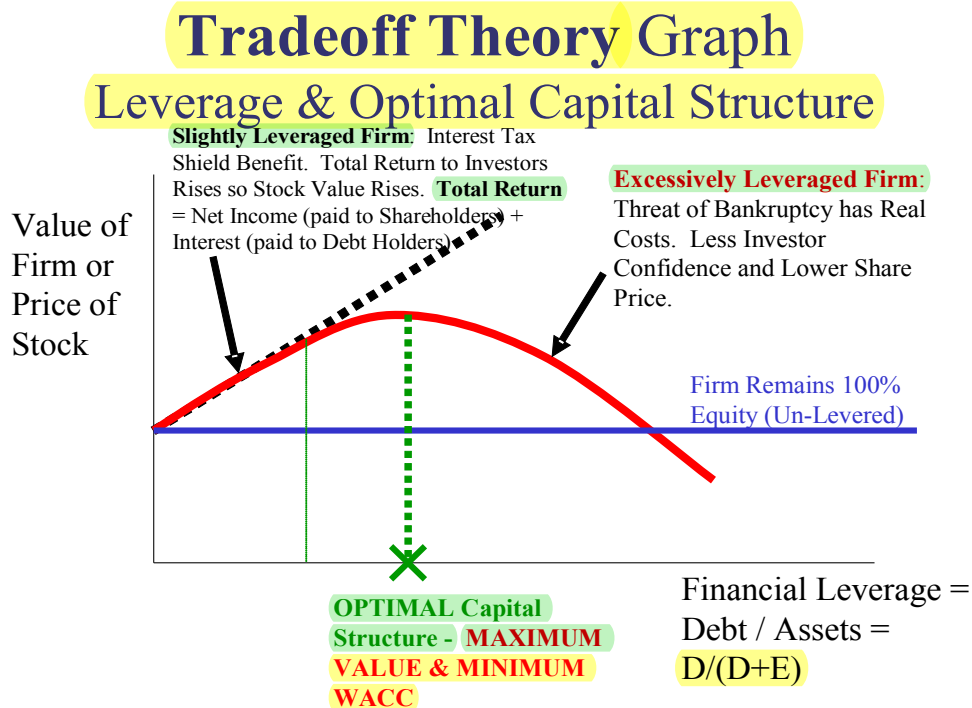
The second major change in MM-theory was to incorporate the effect of bankruptcy costs. In the real world companies face cash problems, their sales might drop, they face more competition, the interest rate might go up, their debt servicing charges might go up, they start incurring losses, making operational cash outflows and this may lead the company to close down or go bankrupt.

- Bankruptcy: when a Firm is forced to close down because of continual Losses and Net Cash Outflows or Default on Interest Payments.
- Bankruptcy Costs Real Money - Companies Do Not Die in Peace! There are costs associated with bankruptcy companies have to pay. Fees paid to Lawyers and Accountants, possible penalties and Legal Claims by Suppliers, Buyers, & Partner Firms, and Loss on Sale of Assets because Firm is forced to quickly Liquidate its Assets and repay the Debt Holders (such as Banks) first.
- Even before bankruptcy the THREAT or RUMOR of Bankruptcy can create problems for a Firm. Suppliers refuse to supply raw materials and cancel Trade Credit facilities. Banks demand higher Interest Rates. Customers cancel Purchase Orders so sales fall.
- If Firm is EXCESSIVELY LEVERAGED (or has a Lot of Debt) then there is a HIGHER Chance of Bankruptcy.
- For Certain Types of Firms, Debt is More Likely to Cause Bankruptcy:
 - Firms with High Operating Leverage or high Fixed Costs
 - Firms with Non-Liquid Assets that are difficult to sell quickly for cash
 - Firms whose EBIT (or Earnings) Fluctuate a Lot

Tradeoff Theory of Capital Structure With Tax & Bankruptcy:

Now let us discuss trade off theory. It mixes a couple of changes in pure MM-theory by taking into consideration both bankruptcy costs and taxes. We will start with a firm of 100% equity capital and see what happens when a firm starts taking debt and gradually increases the percentage of debt in its capital

structure. See the following graph to determine the effect of increasing leverage on the value of firm measured by its stock value to make trade off theory concepts clear:



Keep in mind, Value of Firm = Price of One Share x Number of Shares Outstanding

On the Y-axis we have the Value of Firm or Price of Stock and on X-axis the Financial Leverage = Debt / Assets = Debt / (Debt + Equity) in percentage. In the graph 1.0 shows 100% capital is from debt at that point. Horizontal line represents the case when a firm is 100% equity. It is an unlevered firm. Here firm has no debt so its stock value is not sensitive to financial leverage. Now let us take the case of the same firm if it gradually adds debt to its capital structure.

- When 100% Equity Firm adds a Small Amount of Debt, the Value of its Stock Goes Up at first because Total Return Increases.
 Total Return
 = Net Income (paid to Equity Holders) + Interest (paid to Debt Holders).
 The line therefore rises initially but then it reaches a maximum point which is the optimal capital structure. At this point value of firm will be at its maximum. This is the best debt to equity ratio for this firm at which WACC will be at minimum. After this point firms' debt gets high and it starts facing high interest costs, chances of losing creditors and buyers and threats of bankruptcy. Investors' loose confidence on the share of the firm and the Chances of Bankruptcy will offset the Initial Benefit and the Stock Value will Fall.
- Decision regarding how much Debt (or Financial Leverage) to take is based on Tradeoff between the Advantage of Debt & Disadvantage of Debt.
 - Advantage of Debt over Equity: Interest Payments are Not Taxed. Known as Interest Tax Saving or Tax Shield or Tax Shelter
 - Disadvantage of Too Much Debt: Firm becomes more Risky so Lenders and Banks Charge Higher Interest Rates and Greater Chance of Bankruptcy
- Trade theory tells there is some optimal capital structure or there is some percentage of debt in capital structure for a firm at a particular date. But it does not give us the exact figure for that. A range for the Optimal Capital Structure or Debt/Equity Mix can be calculated in theory. This is where the Firm has Maximum Value and Minimum WACC. Practically speaking it varies across industries and companies. Optimal D/E can range from 20/80 to 70/30 and keeps changing with time depending on the firm's financial health and growth strategy.

Signaling Theory of Capital Structure- An Improvement on Tradeoff Theory:

This is another modification of the theory of Miller Modigliani Capital Structure.

- This theory takes into account the practical fact of the world that NOT all Investors have equal amount of information. All investors are not rational. A Firm's Owners & Managers (Insiders) know more about it than Ordinary outside Investors.
- Signaling Theory: "Insiders (Managers & Owners) Know Better"
 - When Firm's Future genuinely looks Good (i.e. High forecasted Cash Flows, Earnings, NI, and ROE) then Managers will choose to raise financing through Debt (or Bonds or Loan) because they do not want to share the Financial Gain with More Shareholders. Rather They Prefer to Take on Debt and pay a small interest to the Debt Holders. There is almost no risk of Default.
 - When Firm's Outlook looks bad, then Managers will choose to raise capital by Issuing Equity (or Stock) to be able to share the Likely Losses amongst more Shareholders (Owners). If they took Debt and couldn't repay it, they might Default and be forced to go Bankrupt.

So managers are in a better position to decide about the firm.

Signaling Theory – Conclusions:

- Practically speaking, Firms should maintain LESS Leverage than the Optimal Level from Tradeoff Theory.
- Firms Should Save Some Reserve Debt Financing Capacity in case they find a Great Project or Investment Opportunity. They should finance the Project using Debt for 2 reasons:
 - they don't have to share the Financial Gains with more shareholders and
 - they give the Right Signal to the Market of Investors about the good health of their Firm !
 - Debt Financing brings Financial Discipline and tighter cash control on some Managers that waste Shareholders' money
- News of New Equity Financing Signals bad news: It indicates shortfall in cash flows through profit, Investors will sell stock and Market Price (P_0) of Stock will fall. Therefore, Required ROR ($r = \text{DIV} / (P_0 + g)$) will Rise and WACC will Increase. Now more difficult for Projects and Investments to meet this Firm's Capital Budgeting Criterion by showing positive NPV ($= \text{Sum of Cash Flows} / (1+r)^t$).

APPLICATION OF MILLER MODIGLIANI AND OTHER CAPITAL STRUCTURE THEORIES

Learning Objectives:

After going through this lecture, you would be able to have an understanding of the following topics:

- Applicability of the Miller Modigliani Capital Structure theory, Modified Miller Modigliani Capital Structure Theory and other theories to the Real World to see the Impact of Debt on Firm Value & WACC Graphs

Effect of Leverage on Cost of Debt & Cost of Equity:

We need to know both of these effects to see the impact of leverage on WACC.

- **Effect of Financial Leverage (or Debt) on Cost of Debt (r_D):**
 - At low leverage, increase in leverage leads to slight increase in overall risk and return of firm.
 - At higher leverage, there is risk of financial distress & bankruptcy. Therefore, banks raise interest rate charges as now company has become more risky. Cost of debt raises faster and required rate of return (ROR) of firm's debt holders (r_D) raises faster. So, as a result of leverage financial risk of firm rises and its cost of debt also go up.
- **Effect of Financial Leverage (or Debt) on Cost of Equity (r_E):**
 - Firm's total risk rises slowly at low leverage and
 - Firm's total risk rises faster when leverage becomes excessive and risk of financial distress arises. Also, firm's stock beta rises and firm's stock required ROR (r_E) rises, and cost of equity goes up. From the Capital asset pricing model, we know whenever the risk of the firm raises, its required rate of return also rises and as a result cost of stock will also go up.

Effect of Leverage on WACC:

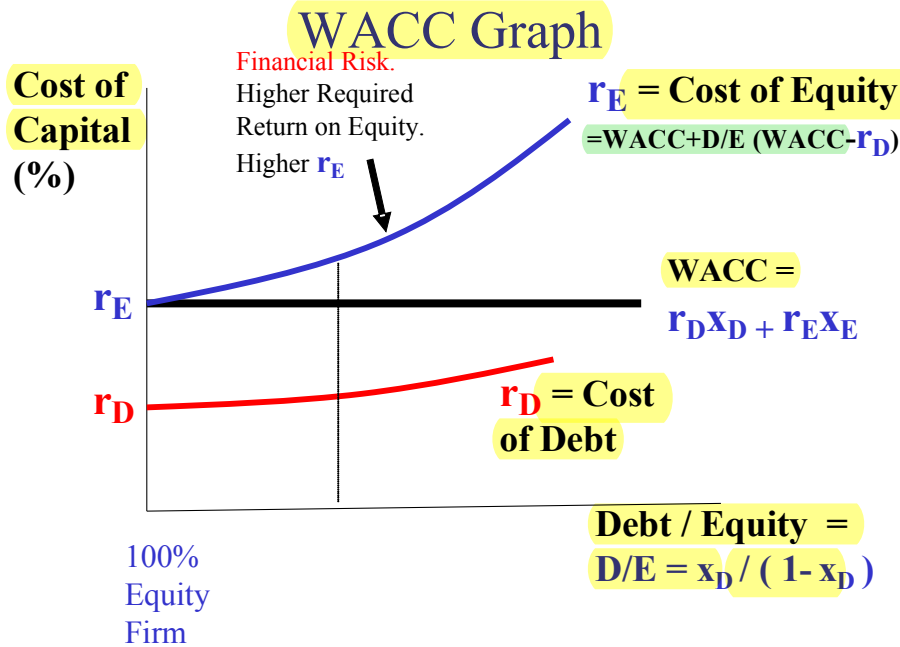
- **WACC = $r_D x_D + r_E x_E$** (assuming no Preferred Equity) where
 x_D = Fraction of Debt
 x_E = Fraction of Equity
- **Effect of Debt on WACC Changes with the theory choice:**
 - **Effect under Pure MM View (Ideal Efficient Markets):** Its assumptions are No Taxes and No Bankruptcy Costs so Debt increases Risk BUT is also cheaper than Equity. Change in Debt has no effect on WACC and Value of the firm. WACC curve is flat.
 - **Effect under Traditionalist View (Tradeoff Theorists, Real Markets):** Combined Effect of Taxes and Financial Distress / Bankruptcy Costs are a Flat U-Shaped WACC Curve with a Minimum Point which represents the Optimal Capital Structure (i.e. Best Debt Ratio for the Firm).

Now we discuss these effects in detail. First we shall discuss Effect of Debt on WACC under MM ideal market theory in detail and then later we will discuss it under traditional view.

Effect of Debt on WACC under MM ideal market theory:

Visualize the following graph keeping in view ideal Miller Modigliani Capital Structure theory conditions and assumptions of no taxes and bankruptcy costs and equal information available to all:

Pure MM Theory - Ideal Markets



On the Y-axis we have cost of capital and on the X-axis Debt to equity ratio is proportional to financial leverage. WACC is constant shown by WACC line starting from point r_E on Y-axis and going straight flat along X-axis. We know $WACC = r_D x_D + r_E x_E$. When Debt to equity ratio is zero at the origin, the firm is un levered or 100% equity firm. As there is no debt the cost of equity of the firm is equal to its WACC at this point. The straight line WACC curve shows there is no change in WACC even after debt under pure MM ideal markets. As the leverage increases, cost of debt and cost of equity rises but WACC remains unaffected.

MM View - Ideal Markets Numerical Example:

Now we do a numerical example to calculate these impacts just discussed above:

- A 100% Equity Firm (or Un-levered) has Total Assets of Rs.1000. It has a weighted average cost of capital for un levered firm ($WACC_U$) of 21% and Cost of debt for un levered firm ($r_{D,U}$) of 10%. It then adds Rs.400 of Debt. Financial Risk increases Cost of debt ($r_{D,L}$) of Levered Firm to 13%. What is the Levered Firm's cost of equity $r_{E,L}$ and $WACC_L$?

- Assuming Pure MM View - Ideal Markets:** Total Market Value of Assets of Firm (V) is UNCHANGED. Value of un levered firm = Value of levered firm. Also, WACC remains UNCHANGED by Capital Structure and Debt.

- $WACC_U = WACC_L = 21\%$

- Now we come to the cost of equity of levered firm

$$\begin{aligned} r_{E,L} &= WACC + \text{Debt/Equity} (WACC_L - r_{D,L}) \\ &= 21\% + 400/600 (21\% - 13\%) \\ &= 26.3\% \end{aligned}$$

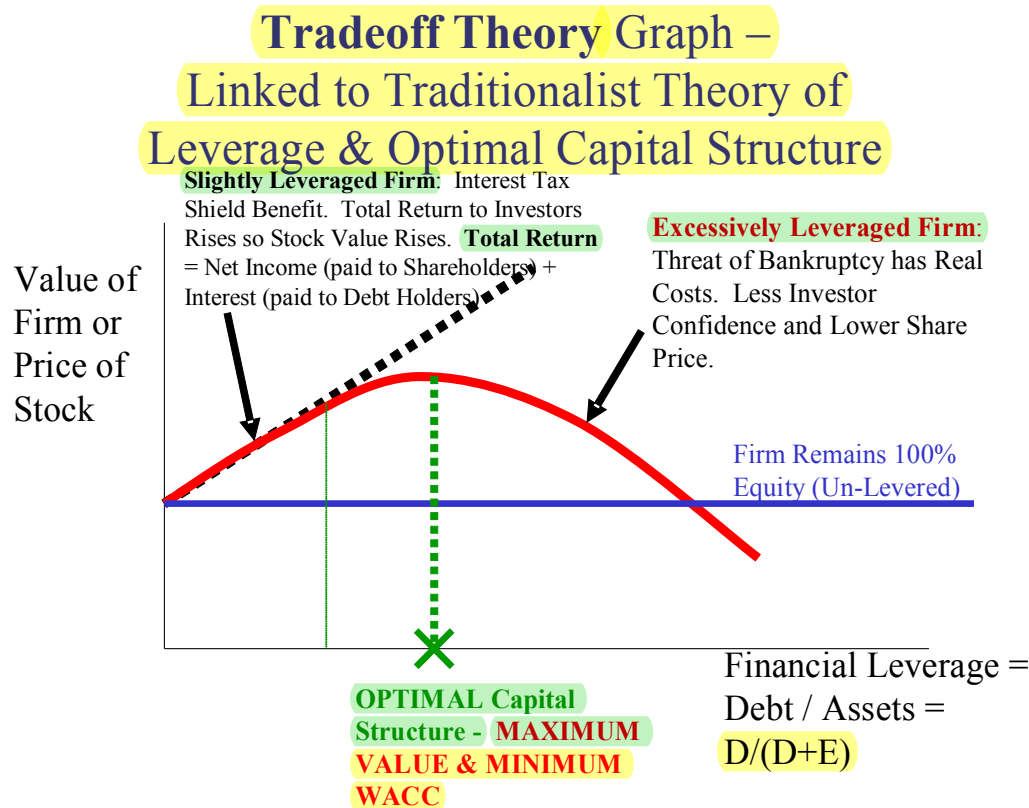
$$\begin{aligned} r_{E,L} &= (WACC - r_{D,L} x_D) / x_E \\ &= (21\% - 13\% (400/1000)) / (600/1000) \\ &= 26.3\% \end{aligned}$$

- Cost of Equity for Levered Firm

$$r_{E,L} = \text{Risk Free Interest Rate} + \text{Business Risk Premium} + \text{Financial Risk Premium.}$$

$r_{E,L}$ increases because required ROR for stock increased because of financial risk.

This is the case of pure MM theory where there are no taxes and bankruptcy costs. But in case of trade off theory in reality initially value of the firm rises as there is interest tax saving but with excessive leverage, value of the firm starts declining as interest cost goes very high due to bankruptcy risk. This can be shown in the following graph:



Here maximum value point of the firm is also the minimum point of WACC. It is the best capital structure for the firm to operate.

Pure MM Ideal Markets – Example:

We know the basic objective of the firm is to maximize shareholder's worth.

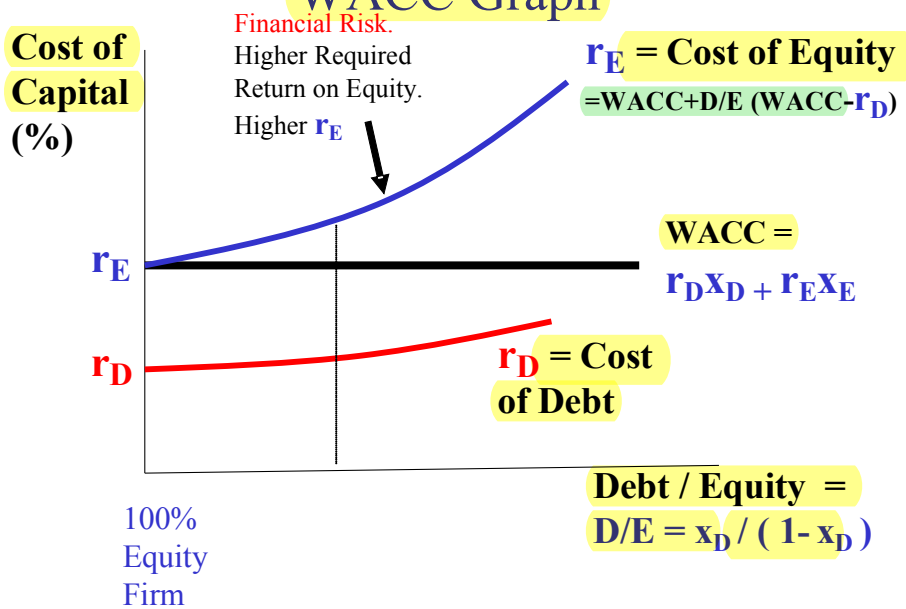
- Example: Assuming Pure MM Theory with Ideal Efficient Markets where Total MARKET VALUE of Assets of Firm ($V = \text{Debt} + \text{Equity}$) is UNCHANGED by the Capital Structure (and Leverage). Given the following Data on Leverage and Cost of Capital:

Debt (D)	Interest (r_D)	Equity ($E = V - D$)	Cost of Equity ($r_E = (WACC - r_D \times D) / E$)
Rs.0 (=V)	0	Rs.1000	21% (=WACC) Un-Levered
Rs.200	10% (r_{RF})	Rs.800	$(21\% - 10\% (0.2)) / 0.8 = 23.75\%$
Rs.300	11%	Rs.700	$(21\% - 11\% (0.3)) / 0.7 = 25.3\%$
Rs.400	13%	Rs.600	$(21\% - 13\% (0.4)) / 0.6 = 26.3\%$
Rs.500	15%	Rs.200	$(21\% - 15\% (0.8)) / 0.2 = 45\%$

As the level of debt increases from Rs.0 to Rs.500 the cost of equity rises from 21% to 45%. Consider the graph we discussed above again:

Pure MM Theory - Ideal Markets

WACC Graph

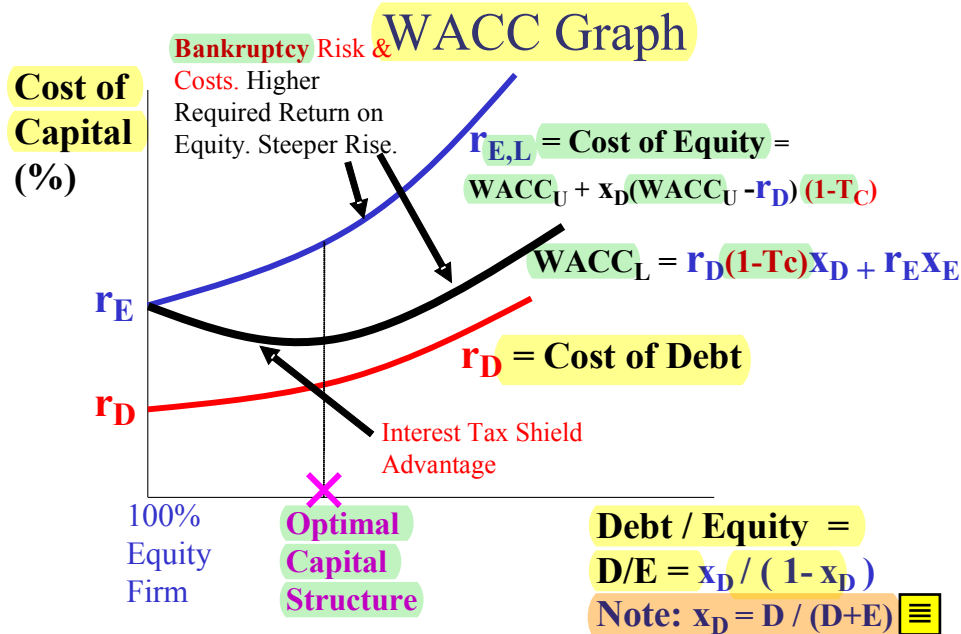


On the Y-axis we have cost of capital and X-axis Debt to equity ratio= Financial leverage. When Debt to equity ratio is zero at the origin, the firm is un levered or 100% equity firm. As there is no debt the cost of equity of the firm is equal to its WACC. The straight line WACC curve shows there is no change in WACC after debt under pure MM ideal markets. As firm takes more debt, the line slope at top in the graph increases at an accelerating rate, this is due to very high debt that has raised bankruptcy risk of the firm.

- **Problem of the theory:** In Real Markets, Total Market Value of Firm (V) DOES CHANGE as Leverage Increases. We have made above calculations very simply under ideal conditions.

So we have a traditional view to take real effects into account. The following is the same graph with traditional views. Here cost of equity for a levered firm rises very fast. Also cost of debt rises. Another point to note is that WACC line has become curve with a minimum point at its lowest. Initially it comes down as it moves away from Y-axis and then after reaching its minimum it starts going up. The minimum point is the best optimal point for firm to operate for its capital structure.

Traditionalist Theory - Real Markets



Traditionalist View – Example:

- We are using same example with some additional information to incorporate the effects of real world: A 100% Equity Firm (or Un-levered) had total assets of Rs.1000. It had a $WACC_U$ (Weighted average cost of capital of un levered firm) of 21%. It then added Rs.400 at a cost of debt $r_{D,L}$ (for Levered Firm) of 13%. What is the Levered Firm's $r_{E,L}$ and $WACC_L$ (Weighted average cost of capital of levered firm)? Given Data for r_E , Corporate tax rate of 30% on Earnings before Tax, and $EBIT = \text{Rs.}300$.
- Traditionalist View is based on Practical Reality. Leverage provides interest tax savings (or shield) but also increases financial risk. Excessive leverage leads to bankruptcy risk. Increases in risk will change value of firm and WACC.
- Now r_E is based on Observed Data and Equity Value (E) is based on Simple Income Statement Formulas.
- Traditionalists Formulas for Equity:

$E = \text{Net Income (NI)} / \text{Cost of Equity for levered firm } (r_{E,L})$

Note that $NI = EBIT - \text{Interest} - \text{Tax} = EBT - \text{Tax}$

$$NI = (EBIT - x_D r_D) (1 - T_c)$$

$$r_{E,L} = WACC_U + x_D (WACC_U - r_D) (1 - T_c).$$

- Traditionalists Formula for WACC:

$$WACC_L = x_D r_D (1 - T_c) + x_E r_E.$$

(1-T_c) is the Tax Discount Factor.

Note: Value of firm = Debt + Equity

$$x_D = \text{Debt} / \text{Value} = \text{Debt} / (\text{Debt} + \text{Equity})$$

$$x_D + x_E = 1$$

$V = \text{Market Value of Firm}$ $D = \text{Market Value of Debt}$

$E = \text{Market Value of Equity}$

$x_D = \text{Fraction of Debt} = \text{A Measure of Leverage}$

In the next lecture we shall continue this discussion and do more examples to see the impact of capital structure on value of firm.

NET INCOME AND TAX SHIELD APPROACHES TO WACC.**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic:

- Net Income & Tax Shield Approaches to WACC**

In the last lecture we discussed the impact of debt on firm value under Miller Modigliani approach in detail with numerical examples. We also discussed the formulae to see the impact of debt on firm value under traditionalist real market concepts. Now we continue the same discussion with the help of an example under traditionalist real market views:

Traditionalists -Real Markets Example:

The following example will help to understand how we can calculate WACC for a firm in the real world:

A 100% Equity Firm (or Un-levered) has Total Assets of Rs.1000. It has a $WACC_U$ of 21% and $r_{D,U}$ of 10%. It then adds Rs.400 of Debt. Financial Risk increases $r_{D,L}$ of Levered Firm to 13%. What is the Levered Firm's $r_{E,L}$ and $WACC_L$? Tax rate is 30%.

Debt (Given D)	r_D (Interest) (Given)	r_E (Given)	EBIT (Rs.)	NI (Rs.)	MV of Equity ($E=NI/r_E$)	Market Value of Firm ($=D+E$)	WACC (%)
Rs.0 (=V)	0	21%	300	210	Rs.1000	Rs.1000	21%
Rs.200	10% (r_{RF})	22%	300	189	Rs.859	1059	19.17%
Rs.300	11%	23%	300	187	Rs.813	1113	18.88%
Rs.400	13%	28%	300	183	Rs.653	1053	20.82%
Rs.500	14%	33%	300	179	Rs.541	1041	21.86%

Following formula has been used to calculate the WACC:

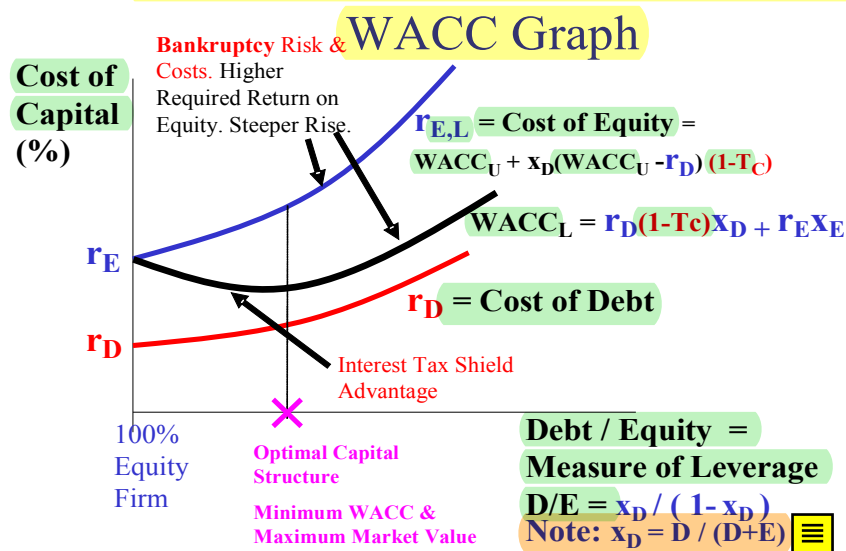
$$WACC_L = r_D x_D (1 - T_c) + r_E x_E.$$

$$WACC_L = 10\% * (200/1059) (1 - 30\%) + 22\% * (859/1059).$$

$$= 19.17\%$$

- Un levered Case:** $D=0$, $r_E = 21\% = WACC$,
Market value of Equity = $E = V$ = Market value of Firm (due to no debt) = Rs1000
- Leverage:** Debt (and Leverage) is gradually increasing from Rs.200 to Rs.500. Change in Leverage Changes the Firm's Value. When Debt = Rs.400 value of firm has Increased to Rs.1053 under traditionalist view whereas we assumed firm value fixed at Rs.1000 in Pure MM Ideal Market Example. Rise in value of firm is due to interest savings.
- Optimal Capital Structure** occurs at Debt of Rs.300
(i.e. $x_D = D / V = Rs.300 / Rs.1113 = 0.2695$). So a Financial Leverage of 26.95% is the Best Capital Structure for this Firm. Here, $WACC = 16.8\%$ and value of the firm at its highest = Rs.1113.
- After this point value of firm starts falling and WACC rising.

Traditionalist View - Real Markets



Here cost of equity for a levered firm rises very fast. Also cost of debt rises. Recall we have studied this graph earlier in previous lectures. Here point to note is that WACC line has become curve with a minimum point at its lowest. Initially it comes down as it moves away from Y-axis and then after reaching its minimum it starts going up. The minimum point at WACC is the best optimal point for firm to operate for its capital structure.

Traditionalists - Real Markets Effect of Leverage on WACC:

- Interest Tax Savings Increase, Cost of Interest or Mark-up Increases, and Cost of Equity Increase. Depending on the Rate of Increase, they can affect computation of Firm's Market Value (V) and WACC in different ways - either making them Increase or Decrease.
- Effect of Increasing Leverage (as measured by Debt/Equity or $x_D = \text{Debt/Value}$) on MARKET VALUE of Firm (V) is Uncertain. Based on Combination of EBIT, Tax Rate, Leverage, and Relative Costs of Debt & Equity.
- Practically speaking, Initially Leverage adds Interest Tax Savings Benefit so Value (V) rises but after some point the Cost associated with Financial Distress and Bankruptcy Risk makes the Value Fall. MARKET VALUE of Firm (V) typically reaches a MAXIMUM VALUE where WACC is MINIMUM. This is the Optimal Capital Structure.

NI Approach for Calculating Numerical value of WACC of Levered Firm – Example:

- Starting Point for Calculating Numerical Value of WACC using NI Approach is EBIT of Firm = Rs.100 and Corporate Tax Rate, $T_c = 30\%$
 - If the Firm is 100% Equity (or Un-Levered) and $r_E = 20\%$ then what is the $WACC_U$ of Un-levered Firm?
 - Net Income = EBIT - Interest - Tax
 $= 100 - 0 - 0.3(100)$
 $= \text{Rs.}70$
 - Market Value of Un-levered Equity = E_u
 $= NI / r_E$
 $= 70 / 0.2$
 $= \text{Rs.}350$
 - Market Value of Un-levered Firm = V_u
 $= \text{Equity} + \text{Debt}$
 $= 350 + 0$
 $= \text{Rs.}350$
 - $WACC_u = r_{E,u}$
 $= 20\%$

- If the Firm takes Rs.100 Debt at 10% Interest or Mark-up then what is the WACCL of Levered Firm?
 - Net Income (NI)

$$= 100 - 10\% (100) - \text{Tax}$$

$$= 100 - 10 - 0.3(90)$$

$$= \text{Rs.}63$$
 - Equity

$$= \text{NI} / r_E$$

$$= 63 / 0.2$$

$$= \text{Rs.}315 \text{ (Major Assumption: No change in } r_E)$$
 - $VL = \text{Equity} + \text{Debt}$

$$= 315 + 100$$

$$= \text{Rs.}415. \text{ (Increasing Debt ADDS Value!)}$$
 - **WACCL**

$$= r_{D,L}(1-T_c) x_D + r_{E,L}x_E$$

$$= 0.1(1-0.3) (100/415) + 0.2(315/415)$$

$$= 16.9\%$$

Point to note is that $WACC_L$ is lower than $WACC_U$.

• **Sequence of Steps:**

- (1) Calculate $NI = EBIT - \text{Interest} - \text{Tax}$
- (2) Calculate $E = NI / r_E$
- (3) Calculate $VL = \text{Equity} + \text{Debt}$
- (4) Calculate WACCL

Tax Shield Approach (or NOI Approach) to Calculating WACC of Levered Firm:

Tax Shield = corporate tax rate * value of debt = $T_c * D$

- Relationships between Un-Levered Costs and Levered Costs of Capital
- Sequence of Steps for NOI Approach for Calculating Numerical Value of WACC for Levered Firm:

- Step 1: Starting Point is Market Value of Levered Firm

$$= VL = V_U + T_c D.$$

Unrealistic because VL should NOT keep increasing with Debt

- Step 2: $T_c \times D = \text{Tax Shield Advantage from Debt.}$
- Step 3: Market Value of Equity = $E = VL - D.$
- Step 4: Calculate $r_{E,L} = NI / E.$
- Step 5: Calculate $WACC_L = r_{D,L}(1-T_c) x_D + r_{E,L}x_E$
- **Note: $WACC_L = WACC_U (1-T_c) x_D$** 

- Use Either NI Approach or Tax Shield Approach depending on what Data has been given to you.

Other Short-cut Formulas & Link between Capital Structure & Betas

- Cost of Equity (After Tax) Estimates and STOCK BETAS
 - $r_{E,L} = WACC_U + x_D (WACC_U - r_D) (1-T_c)$
 - $r_{E,L} = r_{E,U} + \text{Debt/Equity} (r_{E,U} - r_D) (1-T_c)$
 - $r_{E,U} = r_{RF} + BETA_E (r_M - r_{RF})$

Recall from CAPM Theory

- WACC (After Tax) Estimates AND FIRM BETA
 - $WACC_L = r_{D,L}(1-T_c)x_D + r_{E,L}x_E$
 - $WACC_L = r_{RF} + BETA_{WACC,L} (r_M - r_{RF})$
 - **Note: Overall Beta for the Firm**

$$= BETA_{WACC,L} = Beta_D x_D + Beta_E x_E$$

MANAGEMENT OF CAPITAL STRUCTURE**Learning objectives:**

After going through optimal capital structure theories, modifications made in them, applicability of these theories, impact of debt on value of firm and WACC, different principles to decide about capital structure and different approaches to WACC calculation now we study the management of capital structure:

Traditionalist Theory - Effect of Capital Structure on Firm Value & Share Price:

- As 100% Equity Firm Takes On More and More Debt (or Leverage):
 - Cost of Capital decreases (cost of debt is cheaper than equity), reaches a minimum point, and then rises (excessive debt increases financial risk).
 - Total Market Value of Firm ($V = D + E = \text{Market Value of Debt} + \text{Market Value of Equity}$) first rises (because of Interest Tax Shield savings), then reaches a maximum point (optimal capital structure), and finally falls (because of excessive fall in Net Income and Equity value because of interest payments).
 - Share Price ($P_0 = \text{Total Value} / \text{Original Number of Shares OR Equity value} / \text{Number of Shares Outstanding}$) first rises, then reaches maximum (same point as maximum Value), and finally falls. Follows same shape as Total Market Value of Firm. Share Price is a measure of Firm Value.

Traditionalist Theory - Effect of Capital Structure on Earnings and Risk:

- As 100% Equity Firm Replaces More and More Equity with Debt (or Leverage):
 - Mean (or Expected) EBIT assumed to be unchanged although excessive debt can cause it to rise because of higher operational costs because of financial distress
 - Mean EBT will fall because interest payments rise
 - Mean Net Income (or Earnings) generally falls continuously because interest payments rise faster than any interest tax savings.
 - Mean Earnings Per Share ($EPS = \text{Net Income} / \text{Number of Shares outstanding}$) generally first rises if number of shares falls if Equity is Replaced with Debt, then reaches maximum (different capital structure mix from that which maximizes Value & Share Price), and finally falls (because interest payments grow faster). Similar shape to Share Price Curve but reaches Maximum at a different Debt Ratio and Capital Structure. For Optimizing Capital Structure, we should focus on Share Price and not EPS.
 - Earnings Risk (Variation or Standard Deviation) Increases because of Leveraging or Magnifying effect of Debt. Debt increases Financial Distress and Risk of Bankruptcy. And if Firm is financially unhealthy i.e. $EBIT / \text{Total Assets} < \text{Cost of Debt}$ then small fall in EBIT can lead to large fall in ROE.

Weaknesses of Capital Structure Mathematical Models:

Here are some of the rules of thumb or general principles financial managers keep in view while deciding for capital structure of the company:

- Forecasting Errors
 - Changes in Cost of Debt and Equity (or Capitalization Rates) are unpredictable when Debt Ratio is changing
 - Changes in EBIT are also difficult to correlate to changes in Debt or Capital Structure
- Share Price and EPS calculation is very sensitive to minor errors in the estimates.
- Focus on Corporate Finance is on Market Value (of Equity, Debt, and Stocks) BUT Market Value may not be so important for Proprietorships and Private Ltd Companies where only a few shareholders to whom the market value assessed by investors in the market is irrelevant.
- Fundamentally, Stock Prices should be fundamentally driven by Operating Decisions and Focus on Improving Earnings and Cash Flows – and NOT by manipulating Capital Structure. Capital Structure and Corporate Financing can be used to fine tune the value.

Practical Capital Structure Management:

- Financial Stability and Conservatism vs. Real-time Capital Structure Optimization! Aim for Target Capital Structure

- Long Run Viability vs. Short-term Stock Price Maximization
- Financial Ratio Targets
 - Coverage Ratio i.e. TIE (Times Interest Earned)
= $\text{EBIT} / \text{Interest}$. Higher (over 2.0) is better.
 - Long Term Debt / Total Capitalization Ratio - about 30%
 - FCC (Fixed Charge Coverage) = $(\text{EBIT} - \text{Lease Rental}) / (\text{Interest} + \text{Lease Rental} + \text{Adjusted Sinking Fund Payment})$. Takes into account Fixed Financial Charges other than Interest
- Maintain Reserve Borrowing Capacity (recall Signaling Theory) in case attractive Positive NPV projects are found & also to give the right Signal to Market
- Management Control
 - use Debt to avoid giving away voting rights and control BUT Creditors can take control if firm becomes insolvent or defaults
 - Corporate Raiders can take over a firm with large assets if debt is too low - using LBO (Leveraged Buy Out). They convince shareholders to give them control in exchange for higher share prices and EPS as a result of future leveraging.
- Firms with (1) solid assets that can be mortgaged as security against a loan and (2) stable sales and Operating Leverage can generally use debt more safely.
- Retained Earnings: profitable firms have sizeable Cash and Retained Earnings. These are ideal sources of capital because No transaction costs.
- High Tax Bracket Firms: such firms have greater advantage in using debt because of large Interest Tax Shield Savings.

DIVIDEND PAYOUT**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic:

- **Dividend Payout**

Dividend Policy is an important area connected to the capital structure in financial management as it helps financial managers to decide how much of the company's profits should be distributed to the shareholders or equity holders in the form of dividends.

Dividend Policy Issue:

- **Earnings and Positive Cash Flows can be allocated to the Following Cash Outflows:**
 - Buying assets like machines, building etc. (Capital Budgeting)
 - Investing in Projects like acquiring new business (Capital Budgeting)
 - Paying Interest to Debt holders (i.e. Banks, Bondholders) ... Value holders who receive a slice of the Firm's value in form of Interest Income.
 - Paying Dividends to Shareholders (i.e. Payout) ... Value holders who receive a slice of the Firm's value in form of Dividend income.

Remember bondholders and shareholders both are investors but debt holders are creditors to the company while shareholders are owners of the company.

- **Major Questions in Dividend Policy:**

- How much to Payout to Shareholders in form of Dividend?
 - Payout Ratio

$$= \frac{\text{Annual Dividend Amount}}{\text{Net Income}}$$

AND

$$\text{Dividend per Share} = \frac{\text{Total Dividend Amount}}{\text{Outstanding Number of Shares}}$$
 - There needs to be a tradeoff between Dividend Income & Capital Gains
- Recall Gordon's Formula:**
- Required Return on Equity or "Cost of Equity"
- $$= r_{CE} = \text{Dividend Yield} + \text{Capital Gains Yield}$$
- $$= \left(\frac{\text{DIV}_1}{P_0} \right) + g$$
- Dividend Yield = Future Dividend / Present Price
- Capital Gains Yield = Dividend Growth Rate
- How to Finance the Dividend Payout?
 - Cash or Stock Dividend
 - Use Internal Retained Earnings OR External Financing (i.e. Debt or Equity)
 - How often to make Dividend Payout?
 - Quarterly, Annually, Monthly... Random?
 - Impact of Dividend Policy on Firm Value and Share Price?
 - Whether or not Paying Out Dividend increases Firm Value or not depends on many things including Return On Equity of Firm versus the Required Rate Of Return (r_E) of its shareholders

To answer this question we need to consider some theories.

Dividend Theories:

- **MM Irrelevance (Miller Modigliani) Theory:**

It is an extension of Miller Modigliani theory of capital structure we studied earlier. Dividend Payout is basically irrelevant because the way you SPLIT cash flows within and amongst the Shareholders and Debt holders has no effect on the Total Value of a Firm = Total debt + Total Equity. Value is determined by HOW MUCH cash flows are generated by the working assets and the business risk of those assets. Also investors are not influenced by whether the dividend is paid in dividend yield form or capital gains yield form. These conclusions were drawn under same ideal assumptions as made in capital structure theory.

- **Bird in the Hand (Gordon & Lintner) Theory:**

This theory is more practical. Shareholder wealth (and Firm's Value) is maximized by a HIGH Dividend Payout because Investors think that Dividend Income is more immediate, regular, and less risky than Capital Gains Income which is uncertain. So firm should pay as high dividend payout as possible.

- **Tax Preference Theory:**

Shareholder wealth is maximized (and cost of equity r_E is minimized) by LOW Dividend Payout because Marginal Tax Rate on Dividends is higher than on Capital Gains. Firms should accumulate high Retained Earnings that can then lead to Share Price Increase (Capital Gain) or Stock Repurchase.

In real world we have to consider both above factors while deciding for dividend payout i.e. time value of dividend income and tax advantage of capital gains along with the following other factors:

Other Factors Affecting Dividend Policy:

- **Signaling Theory (Recall theory we studied earlier):**

- In minds of Investors, change in Dividend Payout signals a change about management's forecast about future expected earnings. So increase in Dividend Payout is seen as Positive Signal that firm will have good earnings in future so Stock Price rises. It has real effects on the trading of shares of the company.

- **Clientele Effect:**

- Investors buy stocks whose Dividend Policy they like and sell the other ones. Change in Dividend Policy can cause change in type of shareholders. Income Investors will invest in High Dividend Stocks. Growth Investors will invest in those stocks offering larger Capital Gains Yield. Income stocks are the shares of the companies who pay regular fixed dividends like large Multinational corporations.

- **Agency Costs:**

- Shareholders (owners) incur agency costs to monitor and keep check on managerial spending and decisions. High Dividend Payout forces firm to go to capital markets to raise external capital. So, management is subjected to outside scrutiny which is an external check on management spending.

- **Legal Restrictions:**

- **Debt Contracts:** Loan Agreements and Bond Indentures restrict Dividend Payout to Shareholders if earnings or net working capital is too low to pay interest. So companies have to fulfill certain conditions and meet targeted ratios.
- **Impairment of Capital Rule:** Dividends can NOT exceed Retained Earnings which are shown on Balance Sheet.
- **Cash Dividends can only be paid with cash:** Cash means cash. If cash balance (shown on Balance Sheet too) is not enough then Sell assets, Raise Equity, or Take Loan ... etc.

- **Dividend Stability:**

- Most firms aim for Steadily Increasing Dividend Policy but it is not easy and is a challenge.
 - Earnings, Cash flows, Capital Structure, and Capital Budgets fluctuate up and down with time but Dividend Payouts should NOT change much – known as “Sticky Dividend Policy”
 - Financial Manager acts as Stabilizer Converting fluctuating unpredictable Incoming cash flows and Transforming them into steady and regular cash outflows to shareholders (in form of Dividends) and debt holders.
 - Standpoint of Investors: Provides low risk regular income for shareholders, signals good future earnings, and growth compensates for Inflation. It keeps running a source income regular to meet their day to day expenses.

Note: $\text{Growth} = g$ 
 = Plough back x ROE

$= (1 - \text{Dividend Payout}) \times \text{ROE}$.

- Standpoint of Firm: Payout small but regular and increasing dividends. It helps to keep reserve earnings to meet future capital expenditure and investment opportunities
- **Steadily Growing Dividend Payout Gives Positive Signals:**
 - Financial Stability
 - Less Risk and Uncertainty

Residual Dividend Model

- **Residual Dividend Model:** Best Practical Model for numerical calculations of optimal Dividend Policy. Sets Long-Term Target Dividend Payout Ratio from which to back-calculate short-term Dividends.
- **Steps in Residual Dividend Model (RDM):**
 - Forecast Capital Budget, Earnings, Cash Flows (for next 5 years)
 - Conservatism: To be on safe side, underestimate the Free Cash Flows
 - Determine Target optimal Capital Structure (or Practically Speaking, “Range” for Debt Ratio) and forecast required Equity (for next 5 years)
 - Use Retained Earnings (internal capital) to finance most of the required Equity because RE is less costly than external financing (higher transaction costs). Retained earnings cost less than loans to acquire finance.
 - Leftover or “Residual” Earnings can be safely paid Out as Dividends in Long Term. Then divide this into Small Yet Regular (may be quarterly) and Steadily Increasing Dividend Payouts.

APPLICATION OF RESIDUAL DIVIDEND MODEL**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **Application of Residual Dividend Model**

In this lecture we shall continue our discussion of dividend policy.

Capital Budgeting, Capital Structure & Dividend Policy:

- Once the Optimal Capital Budget and Target Capital Structure have been estimated for 5 or more years, we can then calculate the Dividend Payout based on Residual (i.e. Left over Earnings) Dividend Model. This is important because it combines Capital Budgeting, Capital Structure, and Dividend Policy.
- Example: Firm with Earnings = NI = Rs.80, Target Debt Ratio = 20% (= D/V).
 - If Capital Expenditure Budget = Rs.100 then total value of firm's financing needs is Rs.100. Debt = Rs.20. So, require Equity = Rs.80 (100 – 20).
 - Can meet Capital Expenditure Budget exactly provided that all of Earnings of Rs.80 are retained. Retained Earnings = Rs.80, Plough back = 100% (= (80/80) x 100). So, Zero Dividend Payout.
 - Dividend Payout would be zero. Assuming that Firm would prefer to use Retained Earnings (internal capital is cheaper) rather than external financing to meet its Capital Budget Outlay.
 - If Cap Ex Budget = Rs.150 then shortfall of Rs.50 (= Total Financing – Budget = 100 – 150). Means Firm has to raise external financing. What kind and at what cost?
 - Can NOT raise external Debt because Target Capital Structure will change.
 - Must raise external Equity. But Cost of Equity will increase. Recall that Transaction and Flotation Costs of External New Stock Issuance is more than Opportunity Cost of Using Retained Earnings.
 - Again, assuming that Dividend Payout would be zero because Firm would want to use entire Earnings as source of cheapest capital to meet Capital Expenditure Budget.
 - If Capital Expenditure Budget = Rs.90 then surplus of Rs.10. What Capital Structure and Dividend Payout?
 - Capital Structure: Total Value of Capital Expenditure Budget = Rs.90. Can NOT use all Rs.80 of Earning as Equity because that would mean a Debt Ratio of 11% (= 10/90 x 100) which is not our target. Target Capital Structure is 20% Debt. So, optimal case is to use Rs.18 (=Rs.90 x 0.2) of Debt. So, Equity should be Rs.72 (= 90 – 18)
 - Dividend Payout: Residual Earnings can be used for Dividend Payout. So, Dividend Payout = Total Earnings – Equity = 80 – 72 = Rs.8. Dividend per Share = Dividend / Number of Shares Outstanding.

Dividend Payout Procedure:

- Declaration Date
 - Board announces Dividend amount and dates i.e. Jan 30th 2003. Based on Recommendation of CEO, CFO, and Treasurer
 - Declared dividend recorded as actual current liability on the Balance Sheet and Retained Earnings reduced by same amount.
 - If announced Dividend is higher than before, generally Stock Price rises because Investors take this to be a Positive Signal about future earnings
- Holder-of-record Date
 - Firm records names of shareholders in the Stock Transfer Register i.e. Feb 28th 2003. About 1 month after Declaration Date
- Ex-Dividend Date (Important)
 - 4 Days before Holder-of-record Date. Deadline for new buyers to notify Firm so that Dividend is paid to them and not the previous registered owners i.e. Feb 24th 2003
 - Share Price expected to DROP by about the same amount as Dividend on this date.

- Payment Date
 - Firm mails cheques to registered shareholders i.e. March 15th, 2003. About 1 ½ months after Declaration Date.

Other Dividend Schemes:

- **Dividend Reinvestment Plans (DRIP)**
 - Firms give stockholders option to automatically reinvest cash dividends by buying more of the same stock
 - Advantage for Firm: no transaction and flotation costs unlike new stock issuance. Cheap way of raising equity.
 - Advantage for Investors: no brokerage fee paid to stock broker
- **Stock Repurchase**
 - Firms offer to repurchase stock at a price above the market price (this is a tricky exercise) in order to compensate shareholders when dividends are cut.
 - Viewed as Positive Signal because shows confidence of management in buying back shares of their own firm
 - Advantage for Investors who want to sell shares: lower marginal tax on capital gains than on dividend income
 - Advantage for remaining Shareholders: number of shares outstanding falls so EPS rises and Share Price rises.
 - Fundamental Share Value Formula:

$$\text{Share Price} = P_0 = \text{EPS} \times (P/E)$$
 - Advantages for Firm:
 - Reduce the “**Float**” (equity or shares owned by outsiders). Removes excess shareholders. Increases management control.
 - Can be used in combination with Residual Dividend Policy to make extra payouts on rare occasions when earnings and free cash flows are in surplus
 - Can be used in combination with Debt Issuance (i.e. Using money from a loan to buy back shares) to make very quick and large changes in Capital Structure. Called REPLACEMENT

Dividend Schemes for Optimizing Share Price:

- Stock Dividends
 - Used to control the share price if it rises too fast. Brings share price down to within an “Optimal Price Range” so that more investors can afford to trade in it and trading volume rises. This is a commonly held belief.
 - Payment in the form of stock to existing shareholders. Can be declared frequently.
 - Example: Company offers 10% stock dividend to all shareholders. Means that if you own 100 shares then company will give you 10 more shares free of cost. Number of shares increases but Total Value of Firm is unchanged.
- Stock Splits
 - Also used to control share price if it rises too fast. Number of shares outstanding increase.
 - Used to increase “Float”
 - Example: Company with 1000 shares outstanding to outside shareholders declares 2-for-1 Stock Split. Means that the number of shares outstanding will increase to 2000 shares (i.e. 100% increase). Number of shares rises but Firm Value unchanged.
- Impact of Stock Dividends & Stock Splits on EPS and Price
 - In both cases (Stock Dividends and Stock Splits), EPS (Earnings PER SHARE = NI / shares) and Dividend PER SHARE fall because number of shares outstanding increases.
Note: FIRM VALUE IS UNCHANGED –only the number of SLICES OF THE VALUE PIE (i.e. Number of Shares) have increases
 - Price rises immediately afterwards because investors take them to be Positive Signals about the Company’s future

- BUT if Company does NOT declare higher earnings and dividends in near future, Price will come back down again.

Summary of Steps in Dividend Policy:

- Forecast Capital Expenditure Budget and Internal Sources of Funds (Next 5 Years).
 - Be conservative: Be on safe side -underestimate the Free Cash Flows
- Determine Optimal Capital Structure (or Range for Debt Ratio)
- Use Retained Earnings to finance most of the Capital Expenditure
- Calculate Residual Earnings and Determine Long-term Dividend Payout.
- Back-calculate the Short-term (Quarterly) Dividend Payout per Share. Set at SMALL CONSTANT value which should grow slowly and never be lowered.
 - Stable Dividends signal financial stability and Less Risk
- Financial Manager and CEO submit recommendation to Board of Directors
- Board Announces Dividend and Dividend Cheques are mailed to Registered Shareholders

WORKING CAPITAL MANAGEMENT**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic:

- **Working Capital Management**

Working Capital Management is another important area of financial management.

- **Financial Management Course**

Earlier in the course we studied:

- Capital Budgeting: Focuses on Fixed Assets side of Balance Sheet
- Capital Structure (& Corporate Financing): Focuses Liabilities Side (Long Term Debt & Equity) of Balance Sheet

Now another important area is:

- Working Capital Management: Focuses Current Assets & Liabilities of Balance Sheet in day-to-day operation

- **Generally Working Capital (Gross) = Current Assets**

- Current Assets = Inventory + Accounts Receivables + Cash + Marketable Securities + ... (The mentioned items are four major items)
- Working Capital is different from “Capital” (as used in Capital Budgeting) which refers to Capital Expenditure in Fixed Assets
- Also it is different from “Capital” (as used in Capital Structure) which refers to Financing in the form of Debt or Equity (Loans or share capital)

- **Net Working Capital = Current Assets – Current Liabilities**

Net working capital is slightly different from gross working capital.

- working capital is different from Net Worth
= Assets – Liabilities = Equity
= Stock + Retained Earnings
- Current Liabilities
= Accounts Payables + Accruals + Short Term Loans + ... (as well as other minor items)

- **Important Measure of the Short-term Liquidity of a Firm**

- Working capital is a measure of how easy it is for a firm to convert short-term assets into “Liquid” Cash in order to meet the Current Obligations by selling assets
- Some ratios to measure liquidity of firm are:
Current Ratio = Current Assets / Current Liabilities
Acid Test or Quick Ratio = Quick Assets / Current Liabilities
 - Quick Assets = Current Assets – Inventory

- **Fundamental Tradeoff in Working Capital (or Current Assets)**

Decision in working capital management is how much working capital should be maintained by a firm. It requires how much money needs to be invested in Inventory, Accounts Receivables, Marketable Securities and how much cash should be maintained.

- Advantages of Large Current Assets: less risk of shortages & interruptions and less loss of sales due to availability of funds for loan payments and purchases and inventory. High Liquidity so better CREDIT Rating.
- Advantages of Small Current Assets: Less investment in current assets means less amount of money tied to the assets which are generating no return. So lower Opportunity Cost of Capital.
- Find the Optimum Current Assets (working capital) At Any Given Time and for a Given Level of Sales & Growth:
 - For this Alternative Investment Policies have been proposed and a good business judgment is required

Working Capital Policies:

- What is the Optimum Working Capital (or Current Assets) for a Firm at any given time given in level of Sales and Growth Strategy? This requirement fluctuates with time depending on sales and seasons.

Practically the following policies are used by the managers to decide what is the best amount of current assets or mix of assets to be kept for the firm:

- **“Fat Cat” or Relaxed Policy**
 - It requires Large Amount of Current Assets not to loose any sales i.e. when a customer places order for a large amount, there is no shortage of inventory
 - Occurs when High sales driven by lot of credit facility to buyers
 - Good Credit Rating because High Liquidity and good Current Ratio
 - Case: Wall Mart retail chain during New Year and Christmas
- **“Lean & Mean” or Restricted Policy**
 - Small Amount of Current Assets
 - It increases turnover and therefore Profits
 - $\text{Current Asset Turnover} = \text{Sales} / \text{Current Assets}$. Higher than 20.
 - Lowers Carrying Costs of Inventory
 - Frees up cash and speeds up production (operational efficiency)
 - Small Current Assets means Lower Opportunity Cost of Capital. Firms have raised Capital from Investors (Debt Holders and Shareholders) which comes at a Cost (the WACC includes Interest paid to Debt Holders and Dividends paid to Shareholders). Firms must mobilize the capital in high-return investments in order to repay their investors.
 - “Zero Working Capital Policy” (Extreme form of Lean & Mean Policy)
 - It can not be 0 in reality but its objective is to minimize.
 - Japanese Just in Time (JIT) i.e. Toyota Motor Co. It means the spare parts reach just a few hours ago from the assembly time.
- **Moderate Policy**
 - In between the Fat Cat and Lean & Mean Policies

Impact of working capital on Firm Value:

There is a link between working capital policy and our basic objective of financial management of maximizing shareholder’s wealth.

- **EVA (Economic Value Added)**
 - EVA (in Rupees)
 - = Net Operating Income discounted by the Tax – (WACC x Total Capital)
 - = $(\text{NOI} \times (1 - T_c)) - (\text{WACC} \% \times \text{Tot Capital})$
 - In other words, EVA (in Rupees)
 - = Revenues generated by firm – Cost of capital by firm
 - Total Capital = Market Value of Debt + Market Value of Equity
 - If Working Capital is reduced, then cash is freed up from the assets to which it was tied up and can be used to reduce dependence on External Financing (Debt and Equity). Total External Capital is reduced and WACC is reduced. It raises EVA of the firm.
 - Higher EVA means Higher Market Value of Firm (V) and Maximization of Shareholder Wealth which is a fundamental objective of Financial Management.
- **ROE (Return on Equity)**
 - DuPont Formula:
 - ROE
 - = Profit Margin x Asset Turnover x Leverage Factor (or Equity Multiplier)
 - = $(\text{Net Income} / \text{Sales}) \times (\text{Sales} / \text{Assets}) \times (\text{Total Assets} / \text{Equity})$
 - = Net Income / Equity
 - If Working Capital is reduced, then cash which is freed up can be used to reduce requirement for External Capital and Total Liabilities. By Total Assets reduced, Asset Turnover Rises, and ROE Rises

- Objective is to keep ROE Higher than r_E (Required Return) and this means keeping capital mobilized and invested at all times to generate returns higher than WACC (which can not be done by simple cash holdings).

Cash Management:

First we talk about first item of working capital in balance sheet i.e. cash

- **Advantages of Cash**
 - Need cash for Liquidity, Good Credit Rating, and Meet Unexpected Expenses & to Get Trade Discounts. “Need Cash to Pay the Bills.”
 - BUT cash (and even Current Business Accounts in banks) earns NO RETURN (i.e. Interest or Markup)
 - When Interest Rates are high, the Opportunity Cost of holding cash rises.
 - Business Competition forces firms to sell on CREDIT but that leads to Problems in RECOVERY of Receivables (i.e. Bad Debts and Write-offs).
- **Balance Sheet Perspective**
 - “Cash is King” and “Only Cash Can Pay the Bills”
- **Cash Budget (Detailed Short Term)**
 - Projected Cash Inflows and Outflows to estimate Monthly Cumulative Net cash Surplus or Shortfall
 - Take into account Credit Purchases and Credit Sales and Expected Collection (Cash Recovery) Time
 - Shortfall tells you how much Short-term Financing is required
 - Importance of Timing of Collections and Payments and Target Cash Balance

Monthly Cash Budget

	January	February	March	April
Sales (Expected Forecasts ‘000 Rs.) (Information)	100	200	300	400
Collections (‘000 Rs.)				
▪ Current month Sales (30%)	30	60	90	120
▪ Previous month Sales (70%)		70	140	210
TOTAL COLLECTIONS	30	130	230	330
Purchases Raw Material (‘000 Rs.)				
70% of Next Month Sales (Information)	140	210	280	
-Payments of purchases (paid next month)		140	210	280
Other Expenses (‘000 Rs.)				
▪ Wages	10	10	10	10
▪ Rent	10	10	10	10
▪ Taxes	10	10	10	10
▪ Interest & Dividends	0	0	0	0
TOTAL PAYMENTS	30	170	240	310
Net Cash for Month	0	(0)	(10)	20
Opening balance	0	0	(40)	(50)
Cumulative Cash (Closing balance)		(40)	(50)	(30)
Target Cash Balance	20	20	20	20
Net Cumulative Cash		(20)	(30)	(10)

Note: Closing balance of previous month is opening balance of next month i.e. closing balance of February (40) is opening balance of March.

The above is the cash budget for a firm for a period of four months with the most important items. We have forecasted the cash in the form of cash receipts from sales and in the form of cash payments for expenses. Shortfall or negative balance tells you how much Short-term Financing is required to fill the gap.

Cash Management Policies:

- **Interest-based Policy (Minimize Cash holdings when Interest rates are High)**
 - When Interest Rates are high, the Opportunity Cost of keeping capital in form of Cash (generating zero returns) is higher.
 - Try to make Collections quickly and keep as much cash as possible in profit-earning Marketable securities and Investments in Projects
- **Cash Flow Synchronization Policy**
 - Use “Billing Cycles” to time the Cash Outflows just after the Cash Inflows
 - Example: Salaries paid on 3rd of Every Month. Electricity Bill paid on the 18th of Every Month. Aim for Cash Collections on the 1st and 15th of every month just few days before Cash Outflows.
- **Speed up Cash Collection Policy**
 - Business Competition forces firms to Sell on CREDIT but that leads to Problems in RECOVERY of Receivables (i.e. Bad Debts and Write offs).
 - Collection Staff, Letters, Collection Agency
 - Use Technology: Electronic Wire Transfer, Automatic Debit, Credit Cards
- **Float Policy (Keep Track of Cheques Clearance)**
 - Takes 1-2 days in Pakistan for cheque to turn into cash in your account from the date of deposit.
 - Aim to make your own Cheque Clearing process quicker (minimize your Collections Float) than your Supplier's. That way, you will encash cheques before others can encash yours.
 - So, you will have a Positive Net Float in your Bank account. This cash can be used for emergency expenses.

CASH MANAGEMENT AND WORKING CAPITAL FINANCING**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **Cash Management &**
- **Working Capital Financing**

Cash Dividend Payout Decision:

- Link between Dividend Policy & Cash Management – Cash Dividends are paid out of Cash!
- Cash is an idle asset that do not generate any return for the company
- How should firm decide to pay Cash Dividend based on Its Impact on Share Price and Firm's Value?
- **Gordon's Formula:**

Dividend policy issue of the company can be seen through Gordon's Formula.

$$P_0 (\text{Share Price}) = \text{DIV}_1 / (r_E - g)$$

$$= \text{EPS} \times (\text{DIV}_1 / \text{EPS}) / (r_E - (P_b \times \text{ROE})).$$

DIV₁ = Forecasted dividend in the next year

r_E = Required rate of return on equity

g = Growth rate in dividends

P_b = Plough back ratio

The two criteria that can help to decide about dividend are ROE and r_E .

- ROE is financial accounting measure of the firm's ability to internally generate a return. r_E is the return that the firm's shareholders REQUIRE. Firms try to keep ROE HIGHER than r_E .
- If $\text{ROE} < r_E$ then firm is not generating enough return to meet shareholder requirements so it is better to payout the dividend. Lower ROE means company is not finding sufficient projects to generate enough return higher than rate of return on equity.
- If firm makes Dividend payout, in this case, share price P_0 (and Firm Value) will RISE as dividend announcement has positive impact on company's share price.
- If $\text{ROE} > r_E$ then firm is better off to Plough the Retained Earnings back into the business and investing in Positive NPV Projects or the Firm's core business. In this case, company is generating higher return than the return shareholders require, so the best use of internally generated retained earnings is to use them as a cheap source of capital or financing.
- In this case of $\text{ROE} > r_E$ if firm makes Dividend payout, share price (and Firm Value) P_0 will FALL. Here it makes sense for the company to keep cash and invest it in investments as company is generating positive higher returns on its projects rather than paying dividend.
- If $\text{ROE} = r_E$ then dividend payment has no impact on share price of the company.

Inventory Management:

In the last lecture we studied working capital and cash management in detail. Now we discuss inventory management, another part of working capital.

- **3 Types of Inventories:** Raw Material, Work in Process, Finished Goods
- **Issues to Consider in Inventory Management:**
 - Inventory is acquired BEFORE sales so estimates must be accurate. EOQ (Economic Order Quantity) difficult to estimate otherwise:
 - **Shortfall** in Inventories: interruptions in production and loss or sales orders
 - **Surplus** Inventories: high carrying costs, wastage, and depreciation
 - Case of Eid Time Sales: Using Short-term Finance or Loan to buy extra inventory can be Risky because if you can't sell it, you will be forced to sell at a Deep Discount. So sell at a loss. Cash trickling in BUT Retained Earnings being wiped out. Not enough cash to pay interest on the loan. Possibly default and bankruptcy.
 - Inventory Costs:

- Carrying Costs (cost of capital, storage / warehouse rent, insurance premium, wastage) as high as 20 – 30 % of Inventory value!
- Shipping Costs: Generally Less than 5% of Inventory value!
- Cost of Running Short Loss of sales, customers, and goodwill difficult to estimate.
- **Inventory Management Policies:**
 - **Technology Based:** Dynamic Systems – not only Static EOQ Software for inventory but Dynamic Computer Software that considers Usage Growth Rates. MRP (Material Resource Planning) and ERP (Economic Resource Planning) Software.
 - **JIT:** Just in Time. Developed by Toyota. Supplies arrive just a few hours before they are used. Inventory and Working Capital is minimized. Improves overall Efficiency.
 - **Outsourcing:** Instead of making all the parts yourself, buy them from outside suppliers at a lower cost and avoid any unionism issues. Example: IT Divisions of Large American MNC's outsource the writing of computer software to Pakistani software houses.

Accounts Receivables Management:

This is another area of working capital. Accounts receivables are created out of credit sales.

- Most firms would prefer to sell for Cash BUT Competition forces them to sell on Credit. Example: Fabric trading in Pakistan where sellers offer 1 to 3 months credit (and even longer).
- **Account Receivables**

$$= \text{Credit Sales per day} \times \text{Average Number of Days of Credit}$$
 - Example:
Account Receivables
 $= \text{Rs.}10000 / \text{day} \times 30 \text{ days}$
 $= \text{Rs.}300000$ of fabric “Stuck in the market” or “In Rolling” at any given time.
- A/c Receivables (other than Profit portion which appears in Retained Earnings) need to be Financed somehow i.e. Short-term loan, trade credit, etc.
- $\text{A/c Receivables} = \text{Daily Sales} \times \text{ACP}$
 - $\text{ACP} = \text{Average Collection Period}$
 $= \text{weighted average days of credit. Can be obtained from Ageing Schedule (Financial Accounting)}$
 - Example: Firm makes 30% of sales on 30 day credit and 70% on 60 day credit. So
 ACP
 $= (0.3 \times 30) + (0.7 \times 60)$
 $= 9 + 42$
 $= 51 \text{ Days}$
 - Try to Minimize Average Collection Period and daily credit sales.

Credit Policy:

- **Factors considered for credit:**
 - Credit Quality Aspect: Proper Assessment of Credit-worthiness of each credit customer (Credit Quality)
 - Minimize Time (Credit Duration or ACP) and Value (Credit Given)
 - Creative Credit Terms
- **Incentivize Customers to pay cash and to pay quickly**
 - “Sell on 5/10.net 30 basis”. 30 basis Means customer must pay full cash value within 30 days. 5/10.net means 5% discount for customers who pay within 10 days. So it is an incentive for customer to pay cash quickly.
- **Impose Carrying Charge on Late Payments**
 - Example: 2% late payment Charges if bill is not paid within 30 days. Means 24% penal interest per year! Example: If customer does NOT pay Rs.100000 bill within 1 month, then he will have to pay Rs.2000 extra for every month that he is late!

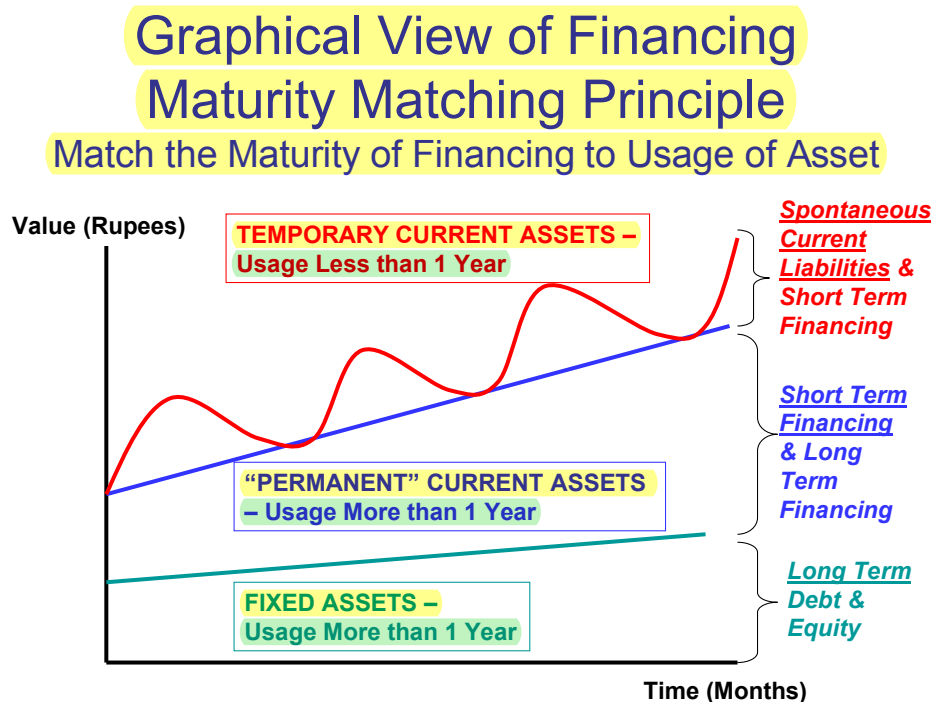
Working Capital Financing Policies:

It involves the discussion regarding how firms should finance this working capital.

- **Sales fluctuate with Nature of Business, Time, Season, State of Economy:**

- Economic Growth or Boom: High inventories and Current Assets
- Economic Recession: Low inventories and Current Assets
 - Never drop to zero because always need minimal “Permanent Current Assets.”
- **Total Assets = Fixed + Permanent Current + Temporary Current.**
 - Total assets steadily grow with life of healthy company.
 - Temporary Current Assets fluctuate with time. Extra Spontaneous Inventory can be financed by short-term debt financing or loan
- **3 Policies for Working Capital Financing (based on Maturity Matching Principle)**
 - **Aggressive**
 - Maximum Short-term financing at low cost (but risk of non-renewal of loan)
 - Use short-term financing for Temporary Current Assets and even partly to buy Permanent Current Inventory
 - **Conservative**
 - Maximum Long-term financing. Safe but higher interest costs.
 - Use long-term financing for Fixed Assets, entire Permanent Assets, and even part of Temporary Current Assets
 - **Moderate**
 - Balance of Long and Short-term Financing.
 - Long Term Financing for Fixed and Permanent Current Assets. Use Short Term Financing for Permanent Current Assets. Use Spontaneous Current Liability Financing for Temporary Current Assets
- **Advantages of Short Term Debt or Loan**
 - Speed of getting finance as they are short run
 - Flexibility (not locked in)
 - Lower Interest Rates (generally Upward Sloping or Normal Yield Curve)
- **Disadvantage of Short Term Debt** is that cost of debt is uncertain and variable in long run. Non-renewable.

Graphical View of Financing Maturity Matching Principle Match the Maturity of Financing to Usage of Asset:



Firms generally pursue moderate policy of financing. Basic logic behind this is **MATURITY MATCHING PRINCIPLE**.

SHORT TERM FINANCING, LONG TERM FINANCING AND LEASE FINANCING**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **Financing (Short Term and Long Term Financing)**
- **Lease Financing**

In this lecture we shall continue our discussion of working capital financing and will discuss financing, short and long term financing and lease financing.

Working Capital Financing:

- Financial Managers spend More than 50% of their time on Working Capital Financing. This has been observed in many companies. In other words, arrangement for funds to meet day-to-day expenses like inventory, raw material supplies and miscellaneous expenses has great significance.

- **Sources of Financing**

- **Permanent Financing:**

Permanent Financing comes in two forms:

- Long-term Loans / Bonds – Duration of this source is More Than 1 Year. It has Low Risk for Firm but has High Cost
 - **Common Equity / Stock - “Perpetual.”** By definition. Less Risk for Firm but Highest Cost.

Recall here concepts of cost of debt and cost of equity we studied in capital structure to decide which source of financing is better for firm and why?.

- **Temporary Financing:**

Temporary financing also has two forms:

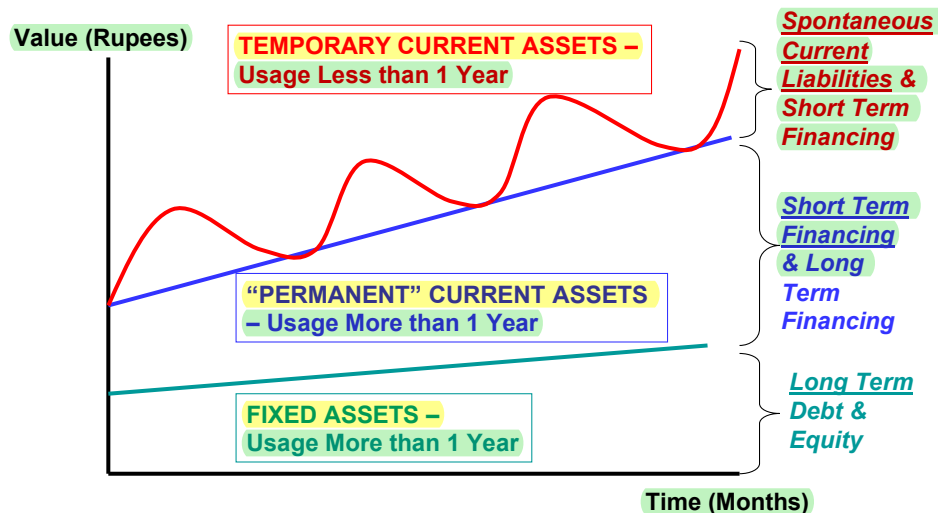
- Short-term Loan (An example of working capital financing) – Duration of this source is Less Than 1 Year i.e. 3 months, 6 months, 9 months, etc. Easier to obtain than Long-term Loan as for long term loans many requirements like financial statements and guarantees need to be fulfilled. Less costly than Long-term Loan due to lower interest rate generally. But this interest costs is variable / uncertain as you have to renew it each time and you are not sure whether you will get the same lower interest rate as before. So More risky. Needs to be rolled over frequently so it is less liquid.
 - Spontaneous Financing - Current Liabilities like Trade Credit and Accrued Taxes (payable) and Wages payable form its base. Arise “Spontaneously” from day-to-day operations. It is in the form of money you have to pay but have not paid yet to your suppliers. It is free loan or credit on which you do not have to pay any interest. As you do not know the amount of money you will have and when, there is Highest Uncertainty / Risk. It has Least Cost (can be free!). But you cannot depend on it for day-to-day expenses as this all is just your rough idea. You are not sure.

- **Tradeoff between Liquidity (Risk) & Profitability (Return)**

- High Current Assets means High Liquidity but Low Profitability. This is due to more money tied in current assets that have low profitability.
 - Low Current Assets means High Profitability but High Risk. This is due to money tied in fixed assets may not be available for payments as they come due.
 - High Long-term Debt means Low Risk of illiquidity but High Cost of Debt in form of interest.
 - High Current Liabilities (or short-term Spontaneous Financing like Trade Debt) means Low Cost but High Risk of illiquidity.

Graphical View of Financing Maturity Matching Principle

Match the Maturity of Financing to Usage of Asset



If a firm uses long term financing it has higher cost of financing comparatively due to high interest cost of long term loans. Despite of this high cost you have low risk here due to surety of access to money for a longer period. Current liabilities as a source of financing are not reliable as you have no surety whether you will have same amount of money available next month for financing or less amount of money or how much money. Also, if firm keeps continue this practice and do not pay its accounts payable will raise so much after a period that it may go bankrupt.

How Much Liquidity to Keep?

- Keep enough Liquidity to meet maturing short term obligations (i.e. Accounts Payable, Interest, etc) on time. How much firm should keep of short term loans and how much of long term loans? The decision is made keeping in view the following principles:
- Hedging Principle (or Principle of Self-Liquidating Debt or MATURITY MATCHING)**
 - Match Cash-flow characteristics of Asset being purchased with the maturity of the Source of Financing used to buy the asset.
- Example:** Shoe Shop Owner can use Current Liability to finance seasonal expansion in inventory during Eid Time. If he uses Long-term financing, then excess / surplus / IDLE LIQUIDITY GIVING LOW / NO YIELD BUT COSTING INTEREST SO LOWER PROFITS. Eid does not come each month. Shop owner needs extra money / inventory only for one month. He should take short term loan. If he decides to take long term loan he will have to pay for extra interest cost unnecessarily.
- Another way of describing the hedging principle is Permanent Asset Investments should be financed by Permanent Financing. Buy Temporary Assets through Temporary Financing.
 - Permanent Asset Investments:** Fixed or Movable or EVEN CURRENT assets (i.e. Inventory) that a firm plans to hold for > 1 Year. The economic life of such assets can be more or less.
 - Temporary Assets:** Current Assets that will be liquidated within 1 year. These are a subset of current assets. For example, inventory in use for less than 1 year.
- Example:** Use Long Term Loan to buy a long term asset. Studio owner should Do NOT use short-term loan (< 1 Year) to buy a sophisticated professional Sony Digital Camera costing Rs.1.5 million which is expected to have an Economic Life of over 5 years and has a Payback Period of 2 Years. Use Long Term Loan with Maturity over 2 Years so that there is sufficient time to repay interest from cash flows of asset (i.e. Camera).

Working Capital Financing Policies:

Total Assets = Fixed assets + Permanent Current assets + Temporary Current assets.

- Total assets steadily grow with life of healthy company.
- Temporary Current fluctuates with time. Extra spontaneous inventory can be financed by short-term debt financing or loan

This will help us to understand which kind of policy should firm adopt according to the kind of assets a firm have.

- **3 Policies of Working Capital Financing (Based on Hedging Principle of Maturity Matching)**
 - **Aggressive**
 - Maximum Short-term financing at low cost (but risk of non-renewal)
 - Use short-term financing for Temporary Current Assets and even partly to buy Permanent Current Inventory
 - **Conservative**
 - Maximum Long-term financing. Safe but higher interest costs.
 - Use long-term financing for Fixed Assets, entire Permanent Assets, and even part of Temporary Current Assets
 - **Moderate**
 - Balance of Long and Short-term Financing. Based on Maturity Matching Principle.
 - Long Term permanent Financing for Fixed assets like land, building, warehouse, machinery and Permanent Current Assets only.
 - Spontaneous financing or short term financing is used for short term portion of current assets

Long-term Debt Financing:

- **What Affects Financing Decisions (Factors influencing the choice of long term finance by managers)**
 - Capital Structure: match Actual Capital Structure to Optimum. “Sticky”, non-smooth, never-ending process. It is not one day work.
 - Maturity Matching (Hedging Principle): match maturity of debt to asset usage time
 - Interest Rates: get long-term financing if long-term interest rates are low
 - Financial Health & Credit-worthiness: get long-term financing while firm is still healthy
- **Short-term Debt**
 - Bank Loans: Maturity period < 1 Year. Collateral (security) required i.e. Property, inventory, or a/c receivables.
 - Commercial Paper: unsecured promissory note issued by large, strong firm
- **Long-term Debt Financing (Maturity Longer than 1 Year)**

The following are the forms of this loan:

 - Bank “Term Loans”: > 1 Year
 - Bonds: Debentures vs. Mortgage vs. Floating Rate
 - Syndicated Loan: for large loans, one lead bank heading team of other banks. Due to large amount of loan one bank alone cannot take the whole risk and liability.
 - Project Financing: for large international infrastructural projects i.e. Electric power plants, dams, development of highways. Group of firms invest equity capital in a New Project. Bank gives loan to New Project. In return, bank is repaid from cash flows of the New Project. In fact, Bank gets the cash inflows first and then decides what to do with them! No other collateral or security is provided. So individual assets of each of individual firms is free. So bank protects itself by keeping control of all the cash flows.
 - Securitization: convert private debt contract into publicly traded financial instrument. A large loan can be divided into smaller parts that are traded in the money markets.

Lease Financing

- **Leasing of Fixed Assets (Financing of Capital Expenditure in Fixed Assets)**

- Leasing Company (Lessor) buys and owns the asset and leases it to the Lessee (Borrower) who can use, operate, and control the asset. Lessee pays Lease Rental to Lessor in return. Lifespan of lease can vary from few days to years.
- Like Collateralized Loan (where the leased asset is the collateral). Lease Contract is just as serious as a loan agreement. Failure to pay lease rental is just like failure to pay interest. Can bankrupt the Lessee (Borrower). Lessor (Lender or Leasing Company) can seize the leased asset and, if the claim is larger, also demand up to 1 year lease rental.
- Ownership vs. Control
- Between 10-30% of fixed assets owned by Large Companies are leased i.e. Warehouses, offices, equipment, machinery, computers, cars, furniture, airplanes!

- **General Advantages from Lessee's (Borrower / user) Point of View**

It guides towards when lease financing should be used:

- Less risky than investing large amount of money in fixed assets in a new businesses that suffer from Cyclicalities i.e. Airplanes.
- More suitable for hi-tech assets that become Obsolete quickly like software houses
- When product demand is uncertain and hence equipment life is uncertain.
- Lender has to share portion of operational risk and maintenance costs e.g. IBM

LEASE FINANCING AND TYPES OF LEASE FINANCING**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **Lease Financing:**
- **Types of Lease Financing:**

Lease Financing:

- **Leasing of Fixed Assets (Financing of Capital Expenditure)**
 - Leasing Company (Lessor) Buys / Owns the Asset and the Lessee (Borrower) Controls, Operates, and Uses it. Lessor receives a regular and fixed Lease Rental. Lifespan of lease is limited (few months to several years).
 - It is just like a Collateralized Loan (where the leased asset is the collateral). Lease Contract is just as serious as a loan agreement. Failure to pay lease rental is just like failure to pay interest. Can bankrupt the Lessee (Borrower). Lessor (Lender or Leasing Company) can seize the leased asset and, if the claim is larger, also demand up to 1 year lease rental.
 - The two parties of lease agreement are:
 - Lessor (Leasing Company)
 - Lessee
 - Ownership vs. Control:
 - Ownership of the asset is with leasing company
 - Control is with lessee
 - In most of the countries 10-30% of fixed assets owned by Companies are leased i.e. Warehouses, offices, equipment, machinery, computers, cars, furniture, airplanes!
- **General Advantages of Leasing from Lessee's (Borrower / user) Point of View**

It guides towards when lease financing should be used:

 - Less risky than investing own large amount of money in expensive fixed assets in a new businesses that suffer from Cyclicalities i.e. Airplanes
 - More suitable for hi-tech assets that become Obsolete quickly.
 - When product demand and hence equipment life is uncertain.
 - Lender has to share portion of operational risk and maintenance costs

Types of Leasing Finance:

- **1- Financial Lease (or Capital Lease)**
 - Popular form of Leasing in Pakistan
 - Financial Lease is Fully Amortized: Lessor recovers BOTH the full Value of Asset (Principal amount) AND the Profit (in form of interest or mark-up). BOTH are built into the Lease Rental amount collected by the Lessor over the lifespan of the Lease. Recall AMORTIZATION TABLE for Bank Loan where Principal and Interest are recovered in equal regular installments.

Fully Amortized Lease means the lessor recovers the principal amount plus interest amount.

 - Financial Lease is NOT Cancelable: If Lessee MUST Cancel or Terminate the Lease Prematurely then pays heavy penalty to Lessor.
 - Example of Financial Lease: You need to buy a Pentium IV computer hardware system complete with peripherals but you don't have enough money. You go to computer hardware store and negotiate the price for the system at Rs.50000. You then contact a leasing company to buy the computer system and lease it to you in return for a monthly rental of say, Rs.5000 per month. After one year, if you have paid all the lease rentals on time, the Leasing Company will transfer the Ownership to you.
 - **Advantage of Financial Lease for Lessee:**
 - If factory needs to buy new machine urgently and does NOT have enough finances.

- Leased Assets (and lease liabilities) can sometimes be treated OFF THE BALANCE SHEET ITEMS. Accounting Standards (i.e. FASB USA) in some countries restrict this so generally speaking, Lease DOES affect DEBT RATIO & Capital Structure in similar way as Loan on Balance Sheet.
- If Company can NOT justify an increase in Assets on the Balance Sheet based on historical earnings. Capital expenditure in Leased Asset can be “Expensed” out gradually.
- Lease Rental is a TAX-DEDUCTIBLE EXPENSE just like interest payments.
- As long as IRR from leased equipment is higher than cost of lease financing.
- **2- Operating Lease (or Service Lease)**
 - Operating Lease offers Financing AND MAINTENANCE: often the Lessor is the Supplier / Vendor of the Asset i.e. IBM
 - Operating Lease is NOT FULLY AMORTIZED AND IS CANCELLABLE
 - Example: Car rental company (Lessor) charges you Rs.1000 per day for renting out a new Honda Civic with driver. You can lease the car for 2 days. You will pay the Lessor Rs.2000. BUT, the value of the car might be Rs.1 million. Lessor does NOT expect you to pay that entire amount for using the car for just 2 days. The car rental company will service and maintain the car in good condition so it can rent it out to other people. This way, they can recover the value of the car from 1000 days of lease rent ($= \text{value} / \text{daily rental} = 1,000,000 / 1000$)!! This is the Payback Period (without taking their maintenance costs and profit margin). You can Cancel the lease and return the car after 1 day. Now you just have to pay Rs.1000.
 - Other Examples of Operating Lease: IBM for Computer Hardware, Boeing for Airplanes

By not fully amortizing operating lease means the leasing company does not expect to recover the whole amount or value of asset from you.

3- Sale & Lease-Back

- Sale & Lease-Back is the Most Interesting Leasing Scheme – creative extension of Financial Lease where the Seller of the asset is the User-lessee. User sells his asset to Leasing Company in return for lump-sum cash and then repays the Leasing Company in form of Lease Rentals over a period of time to buy-back the asset. It is considered to be a creative way of mobilizing your asset to raise debt.
- Example of Sale & Lease-Back: You need Rs.300000 to start a business and all you own is a car. What can you do? Go to Leasing Company. Ask them to buy your car for Rs.300000 and then lease it back to you for 1 year!!! This way, the Leasing Company will take ownership of the car and give you Rs.300000 cash to start your business. Company has bought the car and you can start business from the cash you received. Suppose you expect to earn Rs.50000 per month from your business. Then you can easily pay Rs.30000 per month as lease rental and get your car back in 1 year. Remember company bought car from you for Rs.300000 but you will pay suppose Rs.360000 back to company at the end of period to have your car back. Rs.60000 is the profit or interest or mark-up Company is charging above the principal amount of Rs.300000.

Lease Analyses & Calculations:

- To Buy or To Lease? – That is the Question. Here we are doing some numerical calculations that can help us to decide whether it is better to lease?
- Assume that the Decision to Acquire the Asset has already been made independently at the Capital Budgeting Stage (which comes first).
- First value is NPV (Similar to Capital Budgeting) modified to NAL for Leasing Analysis

- $NAL = \text{Net Advantage of Leasing} = PV(\text{Cost of Owning Asset}) - PV(\text{Cost of Leasing})$. If $NAL > 0$ then Leasing is Better than Buying.
 - **Cost of Owning Asset:** Cost of Owning includes following Cash Flows: Initial investment I_0 , yearly maintenance and service costs, yearly depreciation tax savings, replacement or the salvage value of the asset at the end of its life and Final net residual value (after any tax).
 - **Cost of Leasing** includes following Cash Flows: Yearly Lease Rentals, Yearly Tax Savings associated with Lease Rentals
 - Discount Rate “ r ”: Generate Cash Flow forecasts for life of asset. Cash Flows are quite FIXED AND CERTAIN so use a LOW DISCOUNT RATE = r = mark-up rate on bank loan OR use Risk Free Rate of Return = r_{RF} = T-bill Interest rate. If Company is running in operation then use actual average cost of Debt.
- **IRR (Similar to Capital Budgeting)**
 - Set the $NAL = 0$ and solve for the Discount Rate “ r ” using Trial and Error or Iteration. This gives us the value of IRR.
 - Most commonly used criterion – IRR % can simply be compared to mark-up % on bank loans and also to the market rate of interest and inflation rate.
 - If $IRR < \text{interest rate on loan}$ then leasing is better than buying

Lease Analysis (WACC):

- WACC (Capital Structuring Criterion)
 - $WACC = r_D \times D + r_E \times E$ (where r_D is AFTER-TAX Cost of Debt). Lease IRR % affects the “ r_D ” After Tax Cost of Debt. WACC can be used as the Discount Rate “ r ” in NPV calculations in Capital Budgeting.
 - Practically speaking, corporate financing and capital structure have feedback effect on capital budgeting decision. This means that capital budgeting ranking of projects may have to be revised taking into account the cost of debt (or leasing). The effect is minor because projects are selected based on strategic value and operational efficiency and not just minor differences in NPV. Of course, feedback effect goes entirely against mm theory which is for ideal, efficient markets.
 - Leasing (and financing decisions in general) can (very rarely) have a FEEDBACK EFFECT on Capital Budgeting Decisions. Suppose that you had to choose one of 3 possible projects and you picked Project A based at the Capital Budgeting Stage (based on NPV). Many weeks later, you begin to decide where to raise the money and HOW TO FINANCE Project A. You need to take a bank loan at 15% pa interest. You realize now that another Project B (which had been rejected at the Capital Budgeting Stage) uses equipment that can be LEASED at a lower cost (say 13%). Now, you had done the Capital Budgeting exercise using your company’s WACC as the discount rate in the NPV calculation. That WACC used the company’s actual interest cost on bank loans as the after-tax cost of debt. But, since Project C can use the cheaper Lease Financing, you should RE-CALCULATE its NPV using the Cost of Lease (i.e. IRR) as the discount rate. This case is rare and the difference of a few percentage points in the cost of debt should not change a fundamental decision based on cash-flows, operational effectiveness, and overall strategic advantage of investing in a project which are considered at the Capital Budgeting Stage.

MERGERS AND ACQUISITIONS**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topic:

- **Mergers & Acquisitions (M&A)**

Mergers & Acquisitions (M&A):

- The buying & selling of entire firms or divisions of firms is a specialized art in finance.
- Why firms Merge?
 - Diversification:
 - Reduce Risk and Stabilize Earnings, attain Economies of Scale
 - Achieve Long Term Strategic Goals, Gain Larger Market Share and Quick Growth in size,
 - Improving Financials: quick way to improve the Balance Sheet and Cash Flows
 - Find Cash: if another firm has large cash flows, cash reserves or liquid assets
 - Cherry Picking: It means when Market Value of another similar firm is less than cost of replacing your own assets it might be better to buy another firm
 - Asset Stripping: separate out the non-profitable and sell its assets individually to generate cash and restore profitability
 - Agency Cost: Desire of Managers for Prestige, Power, and Salary sometimes at expense of Shareholders (Owners)
 - Winning Management Control (exercise influence on Board). Manager Salaries Rise (larger firm, Agency Costs). Fear of Losing Job if Taken Over by Rival Firm.
- How do you pay for (or finance) buying a Firm?
 - Cash, Stock or Shares, Bank Borrowing or Debt (LBO's) or Combination
- “Merger” When 2 or more Firms combine to form 1 Firm.
- Benefit of Merger Synergy:
 $2+2 = 5!$

It means value of a combined firm after merger is more than the firms' value individually before the merger

- 2 Broad Categories of Mergers:
 - Pure Financial Merger - Operations remain independent
 - Operating Merger - Operations are Integrated & Changed & Synergies Expected
- 4 Specific Types of Mergers:
 - Horizontal Merger: merger of 2 competitors - can lead to Monopoly
 - Vertical Merger: merger of a supplier with a buyer
 - Co generic Merger: merger of firms in same industry
 - Conglomerate Merger: merger of firms in unrelated industries
- “Acquisition”: Most common form of Merger.
- When a Firm buys another Firm. This acquisition Can be “**Hostile**” **Raid** or “Friendly”
- The firm that acquires the other firm is known as acquirer firm but the firm which is acquired is known as Target firm
- “Divestiture” = Reverse Merger. Benefit of Efficient Reallocation of Resources:
 $5 - 1 = 5!$

It means by selling an inefficient or unproductive unit of the company you can have more value as it saves costs

 - “Sell off” - Sale (transfer Ownership) of a Division of a Firm
 - “Spin off” - transfer Management Control of a Division of a Firm
 - “Liquidation” - Sale of assets to pay off Shareholders

Merger Issues & Regulations:

- **Monopoly (Concentration of Power and Market Share)**
 - Horizontal or Vertical Merger of 2 giants.

- Laws vary from country to country i.e. Anti-Trust Laws
- **Hostile Acquisitions (or Takeovers) by Corporate Raiders**
 - 2 Basic Ways of Hostile Takeovers:
 - Canvassing general public shareholders for their Proxy Votes
 - Limited-time Share Tender Offer by Raider at share price above the market

Corporate raiders urge the shareholders to buy their shares.

- **How Target Firm can Respond to Hostile Raid**
 - **Poison Pill** – Target Firm takes on excessive short-term debt to appear unhealthy. Because of high liabilities their balance sheet becomes unattractive.
 - **White Knight** – a wealthy friendly investor who protects the Target Firm by making higher counter-tender offer against the corporate Raider.
 - **Fight Back**: Target Firm makes counter-tender offer to shareholders
 - **Be Acquired** (if Raider is offering much higher value than Firm is worth)
- Target Firm need protection under law – Shareholders might lose ownership and Employees might lose their jobs.

Leveraged Buy-Outs (LBO's):

- Mechanism of Leveraged Buy-Outs (LBO's) using Debt Financing: Acquiring Firm borrows a lot of money (from Debt Investors) to buy the shares of another publicly traded Target Firm. The Public Firm thus becomes “Privatized” in the hands of fewer shareholders and it also means less administrative costs. It then sells assets (Asset Stripping) of the Target to make immediate interest payments. If Firm runs into difficulty, then can raise more money by selling its own Junk Bonds. After Restructuring, Cost Cutting, and Down-Sizing, the firm (now financially stronger) again goes Public giving opportunity for its stakeholders and deal-makers and Investment Bank Advisers to recover their Investment and earn cash Capital Gains.
- **Possible Advantages of LBO**: Debt increases Tax Shield Savings, Leverage can improve ROE, and forces cost cutting measures by Management
- Management Buyouts & “Going Private”: A type of LBO. Management buys all or most of publicly held shares of their own firm and effectively converts public firm into a privately held one.

Mergers - Good or Bad?

- Impact of Mergers on Market, Shareholder, & Employees
 - Temporary Increase in Stock Price because of competing Tender Offers by Buyer. Wrong signals distort market prices.
 - Target Firms forced to take Drastic Measures to defend themselves i.e. Poison Pills. Waste of Firm's resources and Value.
 - Mergers often followed by Cost Cutting, Streamlining which can improve Operational Efficiency & Add Synergy. BUT, Down-sizing of Employees or Job Cuts can lead to serious social problem

Numerical Valuation of a Target Firm Merger Analysis & Valuation:

- **2 Basic Approaches to Mergers Analysis and Valuation**
 - Discounted Cash Flows (DCF)
 - Market Multiple Analysis (MMA)
- **Discounted Cash Flows (DCF) uses NPV: We used in Capital Budgeting**
 - Estimate Post Merger Performance (Forecasted) Net After-Tax Incremental Cash Flows (CF's) of Target Firm for 5 Yrs or more. Account for Post – Merger Change in Operations impact on incremental Cash Flows.
 - Use Old Present Value Equation:

$$PV = CF_1 / (1+r) + CF_2 / (1+r)^2 + CF_3 / (1+r)^3 + \dots$$
 - Discount Rate (r) or Cost of Capital for Prospective Investors (i.e. Shareholders of the Acquiring Firm i.e. r_{EL}) so focus on Equity Value of Target Firm (not Total Value)

- Use CAPM Theory / SML to estimate r_E (Required Return on Equity for Shareholders) from Beta (or Relative Market Risk) of Target Firm. Then $r_{E,L} = r_{RF} + (r_M - r_{RF}) \times \text{Beta}_L$.

Note that $\text{Beta}_L = \text{Beta}_U [1 + (1 - T_c) (D/E)]$ 

T_c = corporate tax rate

D = Debt

E = Equity

Numerical Valuation of Target Firm Market Multiple Analysis (MMA):

- Market Multiple Analysis (MMA) Approach to Merger Valuation is the most commonly used because it is quick & easy. Approximate Formulas and Ad-hoc Rules of Thumb that change with different Industries and change with Time depending on Macroeconomic Conditions in country
- Example of Market Multiples used in Pakistan:
 - Established Brand and Financially Healthy Textile Spinning Mill:
Firm Value = 10 x Annual Net Income (or Earnings)

The figure 10 comes from stock market reports analysis.

Based on Current Average P/E Multiple for Textile Spinning Sector = Average Market Price of Share / Average EPS = 10.0

- Financially Strong Operational Software House:
Firm Value = 7 x Annual Sales
- Operational Mobile Phone Company:
Firm Value = Rs.100000 x Number of Connections
- Value of Property in Pakistan = 10 x Annual Rental Income

Impact of Merger Price on Value of the Firm:

- **Impact of Merger Price on Value of Acquiring Firm:**
 - If Negotiated Price for Target Firm > Fair Price (or DCF Value Estimate) for Target Firm then Acquiring Firm's Shareholders will Lose Value.

It is so as shareholders are paying more than the fair worth of the target company.

- **Impact of Merger Price on Value of Target Firm:**
 - If Negotiated Price per share of target firm > Market Price of Target Firm's share in Stock Exchange then Target Firm's Shareholders will Gain Value
- Shareholders are being paid price much higher than firm worth.

INTERNATIONAL FINANCE (MULTINATIONAL FINANCE)**Learning Objectives:**

After going through this lecture, you would be able to have an understanding of the following topics:

- **International Finance (Multinational Finance)**

In the lecture we shall cover three areas of International Finance:

- Multinational Finance
- Impact of Globalization and International Finance on different areas of financial management like capital budgeting, capital structure and Capital asset pricing model
- Foreign Exchange (F/x)

First we discuss the first area of Multinational Finance.

Issues of International Finance:

- **All Finance has become International**

- Financial Markets (Money and Capital Markets) of all countries are Linked by hi-speed telecom satellite links, computer, and Internet
- Butterfly Effect – “When New York Stock Exchange Sneezes, the Tokyo Stock Exchange catches a cold”. It explains the impact of capital markets that are linked all over the world. As all the financial markets over the world are linked due to international flow of money and international trade and transactions. So any change in one part of the world has its affects on the other part of the world.

- **All Firms affected by International Factors**

- Even 100% Domestic Firm is affected by International Finance because it competes with Importers and Foreign Franchises substitutes and competing products whose prices change with Foreign Exchange Rate.

- **2 Fundamental Flows Determine a Country's Foreign Exchange Rate**

- International Flow or Trade of Real Physical Goods:
Trade Surplus / Deficit = Imports - Exports
- International Flow of Capital or Money – Balance of Payments (BOP)
= Current Account + Capital Account + Foreign Exchange Reserves. **Current Account** includes Trade of Goods and Services.
Capital Account measures Capital coming in (FDI and Portfolio Investment) and Going Out.
- Domestic Macroeconomic Factors affecting Foreign Exchange:
 - 1) Inflation
 - 2) Fiscal Deficit (if government expenditures exceed their revenues through taxes etc.)

Why do Multinationals Do Business Internationally?

- To Expand Market Share: USA and EU are about \$ 10 Trillion Economies Each. And each has about 300 million people.
- Get Closer to End Users / Consumers i.e. Toyota of Japan in USA
- Lower Production Costs, Shipping Costs, Raw Material Costs i.e. British BAT Tobacco in NWFP, Union Texas in Badin
- Bypass Trade Barriers and Import Tariffs i.e. Pakistanis set up textile units in Srilanka, UAE and Mexico to legally bypass US Textile quota for exports from Pakistan.
- Diversify and Reduce Sovereign (Country-Specific Political) Risk
 - Portfolio of Subsidiary Companies, Divisions, Projects, Investments diversified across different countries can reduce the Sovereign (or Country-Specific Political) Risk
 - Manage Foreign Exchange Rate Exposure. If your home currency is very weak or Depreciating (because of Inflation, Deficits, Political Turmoil etc.) then invest abroad
 - Take advantage of Lower Costs of Debt (interest rates) in foreign countries or lower Taxes.

Major Issues Faced by Multinationals:

- Foreign Exchange Risk i.e. Turkish Lira, Russian Ruble. Caused by Unexpectedly high Inflation, Deficits, and Political Turmoil etc.
- Sovereign and Political Risk i.e. South Africa, Afghanistan, Rwanda - risk of War, Civil Unrest
- Different Laws Business Contract, Property, Companies, Capital Flow & Different Tax Rates, Different Government Involvement, and Different Maturity of Financial Markets
 - Saudi Arabia (Restricted property rights)
 - USA (strict Monopoly laws) vs. Bahamas (Lenient Laws and Tax)
 - Japan (MITI supports Japanese exporters abroad)
- Different Cultures, Customer Awareness about their rights and Quality Standards, Credit Cultures, and Business Practices and Ethics
 - Japanese Kereitsu (Bank is Business Partner and Shareholder) so in Japan large companies like Sony have large of debt in their capital.
 - Korean Chaebols (Conglomerates with Monopoly power)
 - German Consumer Standards
 - Business Ethics i.e. Nigeria vs. Singapore
 - Central Asia (Barter economy and Long Credit Cycle)

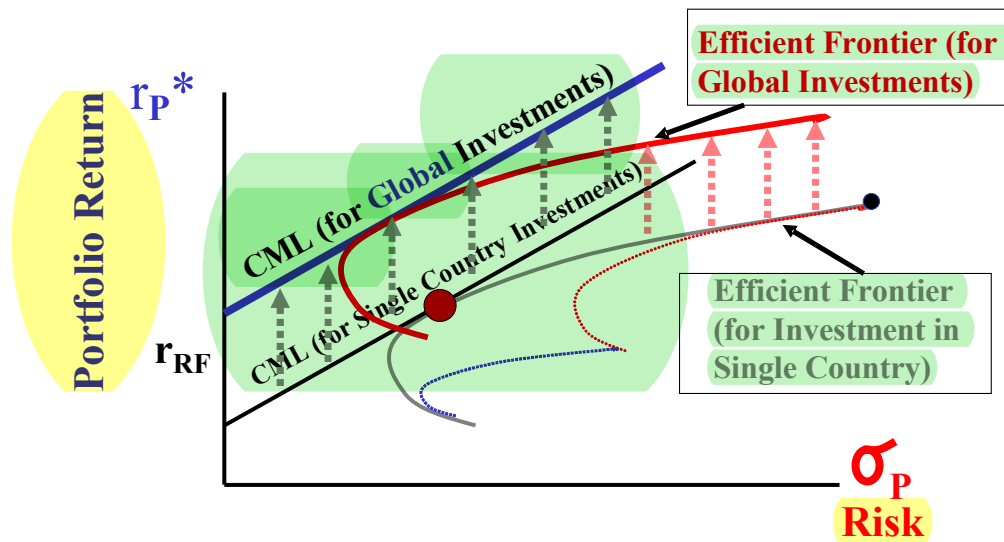
Now we move to the second area of today discussion:

International Financial Management:

- **International Diversification**
 - Bruno – Solnik: These two persons analyzed INTERNATIONAL Portfolio of 20 Stocks has HALF as much risk as same portfolio containing stocks of just 1 country.
- **International CAPM Model for Integrated Global Market**

$$r_P = r_{RF} + \text{Beta} (r_W - r_{RF})$$
 - r_W is the WORLD MARKET Required Rate of Return expected by all investors all over the world
 - Assets are priced in LOCAL (or SEGMENTED) MARKETS so if an Investor can diversify internationally, then he may attain RISK-RETURN above the Local Market Capital Market Line.
 - Global Efficient Frontier (for Investment in World Markets) offers higher Risk-Return combinations than Local Segmented Market Efficient Frontier.

Global Investing Makes the Efficient Frontier and the CML (Capital Market Line) Rise Up
Higher Return for Same Level of Risk



- **International Corporate Financing**

- Raise capital in the country where you can get the best price and yield.
- Euro equities Example ADR's (American Depository receipts): Non-US firms can be listed and traded on the NASDAQ Stock Exchange in USA. So Pakistani firms can raise equity capital in America. Foreign firms can also be listed on Luxembourg stock exchange to raise Equity capital in Euro currency.
- Eurobonds: Currency of bond issue is different from the country of issue. Example: Pakistani company selling US\$-denominated Bonds in Luxembourg can raise Debt capital in Euro currency.

- **International Capital Budgeting**

$$PV = CF_1 / (1+r) + CF_2 / (1+r)^2 + CF_3 / (1+r)^3 + \dots$$

- CF or Cash Flows in foreign countries need to be converted into the Home Currency of the Investor (or country where Head Office is located).
 - Transfer Pricing, Royalties, and Foreign Country's Inflation affect forecast of cash flows
 - Opportunity Cost of Foreign Funds Blocked because of Remittance Restriction
 - Different taxes in different countries. Tax on Remitted Income.
- Discount rate "r"
 - Discount the foreign cash flows in the nominal foreign currency discount rate. Then convert the PV in foreign currency to home currency.
 - Use High Discount Rate if High Level of Country - specific Political or Sovereign Risk
 - Impact of Concessionary Financing can affect choice of "r"

- **International Accounting Standards**

- Profit & Loss Statement (or Income Statement) – Convert foreign expenses and revenues at the AVERAGE F/x Rate prevailing during the Accounting Period.
- Balance Sheet – Foreign FIXED (Non-Financial) Asset values converted at HISTORICAL F/x Rate prevailing at the time of purchase. But, Foreign FINANCIAL Assets converted at AVERAGE F/x Rate prevailing during the Accounting Period.

Foreign Exchange Rate:

- Currencies, like Goods, are bought and sold in markets. The price of a currency increases if the financial, economic, and political health of that Country becomes stronger. Like price of cotton from Pakistan which is different from China and Egypt and changes with quality and Supply/Demand.
- Currencies or F/x are traded in International F/x Markets which is the largest Financial Market of all with trading in Trillions of Dollars. Banks, Firms, and Individuals can trade in Virtual Electronic F/x Markets from their computer 24-hours a day. F/x rates are changing every second!
- The Demand / Supply of F/x affect the Value of the Currency.
- 3 F/x Markets:
 - F/x Spot Market : “Current” exchange rate for Delivery within 2 Days
 - F/x Forwards Market: Make contract today for Delivery in future. Forward Price Determined by Interest Rate Yield Curve and Spot Rate. Contract size and delivery date negotiated privately with banks.
 - F/x Futures Market: Derivative securities whose value is derived from Forward prices and “Mark-to-market” risk premium for meeting minimum balance in Margin Account for trading. Tradable in Exchanges because of Standardized contract size and fixed future delivery dates.
 - F/x Options Market: Derivative securities. Spot Option values derived from Spot F/x Rate. Future Option values derived from Futures F/x Rate. Options (unlike Forwards and Futures) are not obligations. It is cheaper to buy an Option to buy a house than to buy the house! Same for F/x. Also, you can decide not to buy and let the option expire.
 - Call Option – Right to Buy something at a fixed Strike Price for a limited time in the future
 - Put Option – Right to Sell something at a fixed Strike Price for a limited time in the future
 - Valuation or Pricing of Options using famous BLACK & SCHOLES MODEL or simpler Binomial Model

Relationship between Foreign Exchange Rate, Interest Rate & Inflation Rate:

- Spot F/x Rate of 2 Countries determined by Prices of Real Goods:
 - **Relative Prices of Same Good – Purchasing Power Parity Theorem (PPP)**
 - Spot price (Rs. / US\$) = Price (Pak) / Price (USA)
 - Example: Use Price of Levis Jeans made in Pakistan and USA to estimate the theoretical Spot F/x Rate. Price of Levis 501 is US\$50 in USA and Rs.3100 in Pakistan so the Estimated Spot F/x Rate = S (Rs. / US\$) = Rs.3100 / US\$50 = Rs.62 / US\$1. This is close to the actual Spot F/x rate in range of Rs.50-60.
- Nominal Interest Rate determined by Expected Inflation.
 - **Relative Expected Inflation Rates (g) – Fischer Effect**
 - $(1 + i_{Rs.}) / (1 + i_{US\$}) = (1 + g_{Pak}) / (1 + g_{USA})$
- Forward F/x Rate determined by Interest Rate Yield Curve
 - **Relative Interest Rates (i) - Interest Rate Parity Theorem (IRP)**
 - $F (Rs. / US\$) / S (Rs. / US\$) = (1 + i_{Rs.}) / (1 + i_{US\$})$
 - Example: Use 1 Year Estimate of Interest Rates in Pakistan and USA to estimate the 1 Year Forward F/x Rate. Using Yield Curves, you know that the interest on 1 Year Maturity in Pakistan is 10% and in USA 2%. You know that the current (or Spot) Rate is Rs.60/US\$1. So, the 1 Year Forward Rate

$$= F = S (Rs. / US\$) (1 + i_{Rs.}) / (1 + i_{US\$})$$

$$= (60) (1 + 0.1) / (1 + 0.02)$$

$$= Rs.64.7 / US\$1.$$

In other words, we have forecasted the F/x Rate after 1 Year.

- 2 Conventions for Quotation of F/x Rates used by Banks and F/x Dealers:
 - American: US\$ / FCY i.e. US\$0.9 / 1Euro (means “Bid US\$ 0.9 / Ask 1 Euro”)

- European: FCY / US\$ i.e. JY100 / US\$1, Rs.60 / US\$1.
- Inverse Relationship: European = 1 / American. So, Japanese Yen (JY) under American Convention = 1 / 100 = US\$0.01 / 1JY. Commonly written as 1.000.

In Pakistan generally we follow European convention.

- PAIR of Market Prices for Every Currency in the F/x Market
 - BID Rate = Buying Price for Currency. Example: Bid Rs.60 / US\$1 Means Bank or Money Changer will Buy (or Bid) one US\$ from you for Rs.60. This also means that you (the Customer) are Selling Dollar to the Bank. Bid Rs.60 / US\$1 means Bid Rs60 / Ask US\$1
 - ASK Rate = Selling Price for Currency. Example Ask Rs.61 / US\$1 Means Bank or Money Changer will Sell (or Ask) one US\$ to you for Rs.61. This also means that you (the Customer) are Buying Dollar from the Bank. Ex. If you are going to travel abroad to USA.
 - Fundamental Principle for F/x Traders and “Money Changers”: Buy Low and Sell High. So, ASK > BID Rate.
 - Standard Quotation Format: Bid Rate / Ask Rate.
 - Ex 1. “US\$ 60/61” means Money Changer will Buy 1 US\$ from you (the customer) for Rs.60 BUT they will Sell 1 US\$ to you for Rs.61. Means a Profit of Rs.1 for every US\$ traded!
 - Ex2. If you see only 1 Quote i.e. “US\$ 60” then it generally refers to the Bid Quote i.e. Bid Rs60 / US\$1.
- Cross Rates (Transitivity of F/x Rates)
 - Example with Either Bid OR Ask Rates: Suppose you want to convert your Euros into US Dollars in Pakistan and you need to estimate the E/US\$ F/x rate. Money Changers and Banks in Pakistan show Spot F/x Rates in Rupee-Terms: Rs.60 / 1US\$ and Rs.55 / 1Euro. Then Spot US\$ / Euro = (US\$ / Rs.) x (Rs. / Euro) = (1US\$ / Rs. 60) x (Rs55 / 1 Euro) = US\$ 0.9167 / 1Euro
 - If you are given Both Bid and Ask Rates, then Estimate the Cross Rate RANGE.
 - Bid Euro / Ask US\$ < (Bid Euro / Ask Rs.) x (Bid Rs. / Ask US\$)
 - Ask Euro / Bid US\$ > (Ask Euro / Bid Rs.) x (Ask Rs. / Bid US\$)

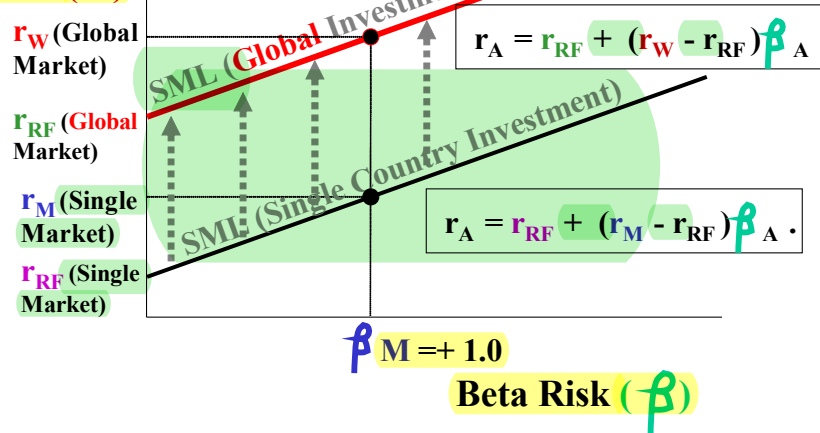
Global Investments

Make SML (for Efficient Stocks) Rise Up

Higher Return for Same Level of Risk

Required

Return (r^*)



FINAL REVIEW OF ENTIRE COURSE ON FINANCIAL MANAGEMENT.**Outline of 5 Major Areas of FM:****1- Interest Rates**

- **Compounding** (money grows with time)

Discrete Annual ($FV = PV (1+r)^t$) vs.

Discrete Multiple / Fractional ($FV = PV (1 + (r/m))^{mn}$)

“n” number of years,

“r” is the Discount Rate or Opportunity Cost of Capital or WACC depending on your perspective

“m” times a year interest is compounded

- **Discounting (or Reverse-Compounding)**

$$PV = FV / (1+r)^t$$

- **Annuity and Perpetuity**

FV Annuity = $CCF [(1+r)^n - 1] / i$. Limited time period.

PV Perpetuity = CCF / r .

- **Yield Curves and Term Structure**

- Normal Yield Curve is Upward Sloping. Interest Rates rise with maturity or life of Bond.

Geometric Average:

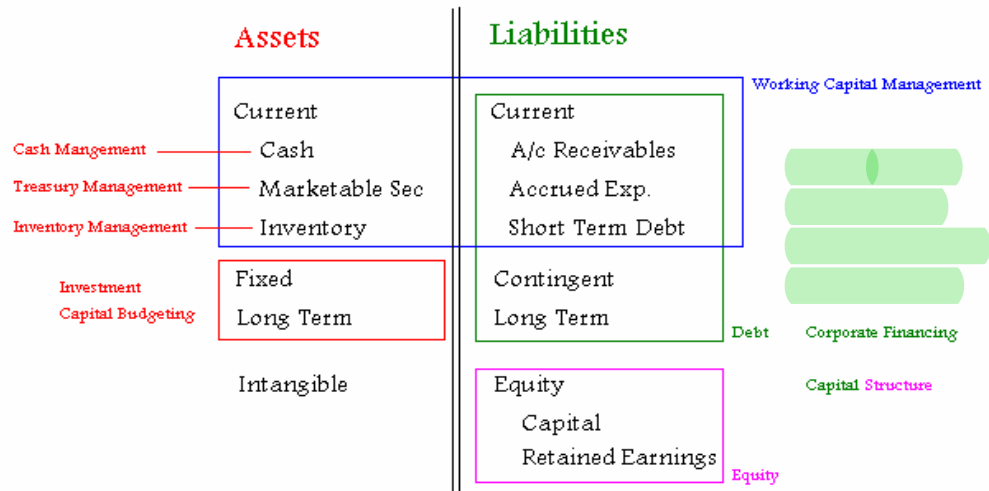
- $(1 + 2Yr \text{ Bond YTM})$
 $= (1 + 1Yr \text{ Bond YTM } 1st \text{ year}) \times (1 + 1Yr \text{ Bond YTM in } 2nd \text{ Year})$.
- Nominal $i = \text{Real } i + \text{Inflation} + \text{Risk Premiums (i.e. Liquidity Risk} + \text{Maturity Risk} + \text{Sovereign Risk)}$

- **Financial Statements and Ratios**

- Balance Sheet, Profit and Loss Account (Income Statement) and Cash flow statement
- DuPont = Profit Margin x Asset Turnover x (Assets/Equity),
- Margin = Net Income/Sales
- Turnover = Sales / Assets
- **Important ratios:** ROA, ROE, EPS, P/E, Plough back P_b , Current ratio, Debt/Capitalization, TIE
 - $ROA = (NI + \text{Interest}) / \text{Total Assets}$ and $ROE = NI / \text{Equity}$
 - $EPS = NI / \text{No. of Shares Outstanding}$ and P/E and Plough back ($P_b = g / ROE$ where “g” is Dividend growth rate %)
 - Current Ratio (=Current Assets / Current Liabilities), Debt/Capitalization or Leverage Ratio, TIE

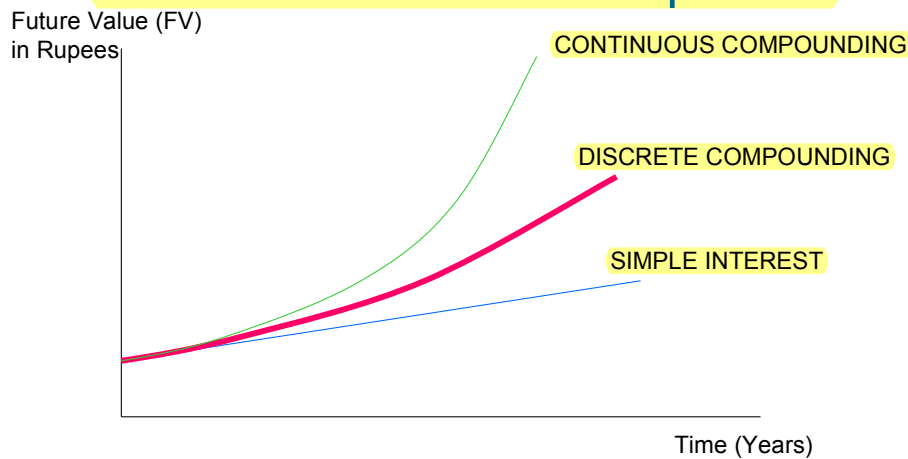
FM Perspective of Balance Sheet

Balance Sheet – an FM Perspective



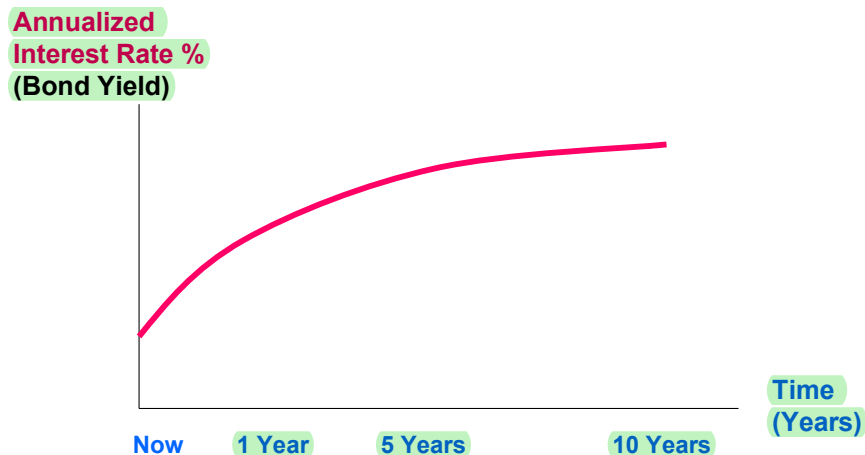
Note: FM uses market value basis unlike Financial Accounting which generally uses historical basis.

Graphical View of Simple, Discrete Compound, & Continuous Interest - Important



Yield Curve for Bonds

Term Structure of Interest rates



2- Capital Budgeting and Investment Decisions to Rank Projects - Fixed assets Side of Balance Sheet

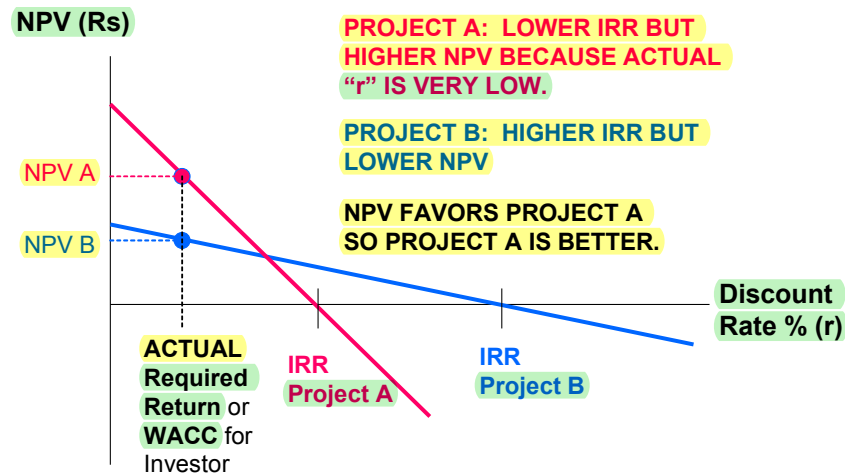
- **Objective of Financial Management:** Maximization of Shareholders' (Owners') Wealth. Maximization of Value of Firm. Maximization of Value of Shares of the Firm.
- **Cash Flows = CF**
 = Net After Tax Incremental Cash Flows
 = NOI + Depreciation + Cost Savings – Extra Taxes + Any Salvage Value
 Cash Flow Diagrams / Time Line: Cash Inflows (Upward Arrows)
- **NPV or DCF** (Best Criterion) – Highest NPV Project is Best.
 NPV uses Discount Rate
 = Required ROR or WACC which can be changed for every year and varies depending on the Investor's Risk Profile.

$$NPV = PV - I_o$$

$$= -I_o + CF_1 / (1+r) + CF_2 / (1+r)^2 + CF_3 / (1+r)^3 + \dots$$
 For comparison of projects with Unequal Lives use **Adjusted NPV**
 = NPV x EAA where EAA Factor = $[i \times (1+i)^n / (1+i)^n - 1]$
- **IRR (%)** - Higher IRR is better. Fixed throughout life of project,
 If Multiple IRR then use $(1+MIRR)^n = FV \text{ Inflows} / PV \text{ Outflows}$.
 FV = Future Value and PV = Present Value
- Capital Rationing – Limited Budget, % Budget Utilization

NPV – IRR Diagram

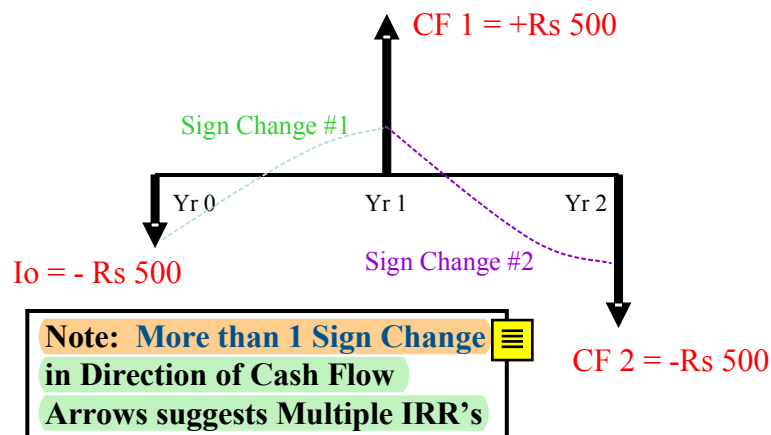
Combined Use of NPV & IRR to Compare 2 Projects - Important



Non-Normal Cash Flow Diagram

Multiple IRR Example

$$(1 + \text{MIRR})^n = (\text{FV Cash Inflows}) / (\text{PV Cash Outflows})$$



3- Securities Valuation

- **Fair vs. Market Value** - PV Formula gives Fair (Intrinsic) Value
- Market Value is determined by Investors in Market and buying /selling of securities.
- **Bond Pricing and YTM** - Bond is Legal Paper representing Debt
 - Use PV Formula to Calculate Bond Price:

$$PV = CF1 / (1+r_D) + CF2 / (1+r_D)^2 + \dots + \text{PAR value} / (1+r_D)^n$$
 - Cash Flows = CF = Coupon
= Coupon Rate (%) x Par Value
 - Coupon Rate (fixed) vs. Discount Rate (r_D Required Return for Bond Investor)
 - YTM = IRR for Bond. Set PV = 0 and solve for " r_D " using Iteration.
 - Bond Ratings of FIRMS by Moodys and S&P.

– Share Pricing and Yields:

Stock is Legal Paper representing Ownership

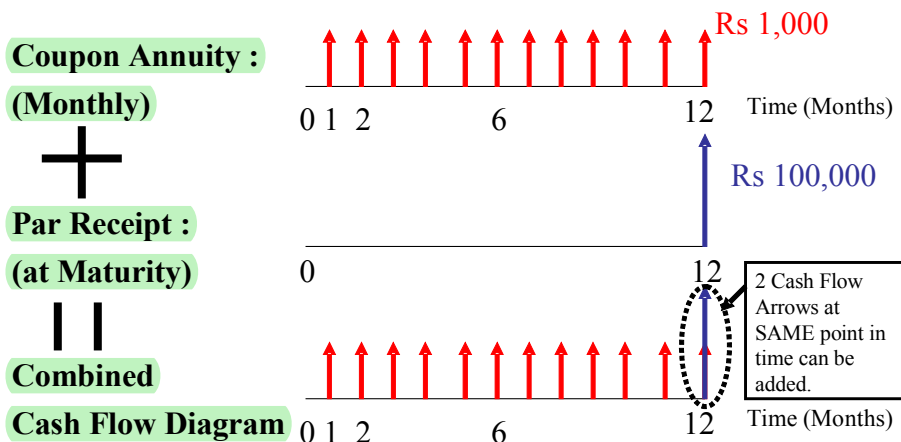
- Market Price of Share = $P_0 = \text{EPS} \times P/E$
- Gordon's Formula is IMPORTANT: r_E = Required Return on Equity for Shareholders
 $= (\text{DIV}_1 / P_0) + g$ = Dividend Yield + Capital Gains Yield.

Note: DIV_1 is expected future Dividend NEXT year. P_0 is price THIS year. 

- Earnings Approach: $P_0 = (\text{EPS} / r_E) + \text{PVGO}$.
 - $\text{PVGO} = \text{NPV}_1 / (r_E - g) = [-I_0 + (C/r_E)] / (r_E - g)$
 - I_0 = Value of Reinvestment = $P_b \times \text{EPS}$ where P_b = Plough back = $1 - \text{Payout} = 1 - (\text{DIV}/\text{EPS})$
- Shareholders' Required ROR ($= r_E$) vs. ROE ($= \text{NI} / \text{Equity}$)

Bond Cash Flow Diagram

Savings Certificate Example



4- Risk and Return

– Securities

- Single Stock Risk = Standard Deviation
 - **Single Stock Return:** measured by Share Price or Capital Gain or Return (r_E)
 - Single Stock Risk = Standard Deviation = Sq. Root of Variance in the Expected Return
 - Total Risk
 $= \text{Diversifiable (Company Specific) Risk} + \text{Market Risk}$
 - **Portfolio Theory and CML**
 - Portfolio Return - Weighted Average Formula
 - Portfolio Risk: Risk Matrix, Covariance of each stock with entire Market, Correlation Coefficient
 - Risk – Return Graph: Hook-shaped Curve, Efficient Frontier, T-Bill Portfolio and CML
 - Portfolio of Stocks Return: Weighted Average Formula.
 2-Stock Portfolio's Expected Return
 $= r_P = x_A r_A + x_B r_B$
 - Portfolio Risk: Measured by Sigma P (standard deviation).
- 2 Stocks:

$$P = X_A^2 \sigma_A^2 + X_B^2 \sigma_B^2 + 2 (X_A X_B \sigma_A \sigma_B \rho_{AB}).$$

- Risk Matrix , Covariance of each stock with entire Market , Correlation Coefficient
- Risk – Return Graph for Portfolio of Stocks

Hook-shaped Curve: possible to reduce risk and raise return together

Efficient Frontier shows all possible efficient portfolios

“Risk Free” T-Bill Portfolio is always available to all investors

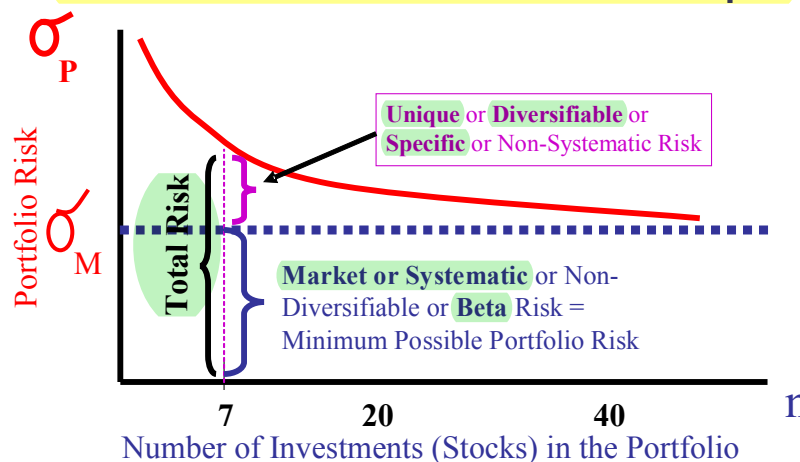
CML connects Risk Free Return and Tangent to Efficient Frontier

3-Stock Portfolio Risk Formula

RISK MATRIX

	Stock A	Stock B	Stock C
Stock A	$X_A^2 \sigma_A^2$	$X_A X_B \sigma_A \sigma_B \rho_{AB}$	$X_A X_C \sigma_A \sigma_C \rho_{AC}$
Stock B	$X_B X_A \sigma_B \sigma_A \rho_{BA}$	$X_B^2 \sigma_B^2$	$X_B X_C \sigma_B \sigma_C \rho_{BC}$
Stock C	$X_C X_A \sigma_C \sigma_A \rho_{CA}$	$X_C X_B \sigma_C \sigma_B \rho_{CB}$	$X_C^2 \sigma_C^2$

Portfolio Size vs Risk Graph



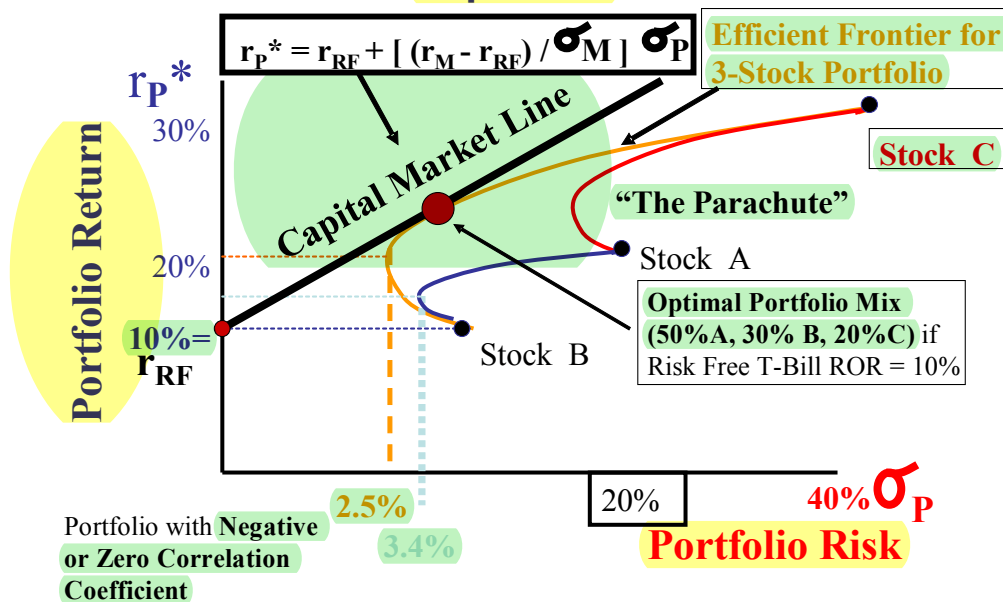
Note: About 100% of the Diversifiable Risk (and 50% of the Total Risk) can be removed by Diversification across 40 stocks. Just 7 carefully chosen Un-Correlated Stocks might be enough to remove 30% of the Total Risk.

- CAPM and SML -Efficient Markets, Beta, Non-diversifiable Market Risk, Risk Premium, Required ROR on Equity
 $(r_E = r_{RF} + (r_M - r_{RF})\text{Beta})$
- CV (Coefficient of Variation) = Risk / Return

Criterion combines BOTH Risk and return in deciding which is the Best Investment (Capital Budgeting)

Portfolio Efficient Frontier & CML -

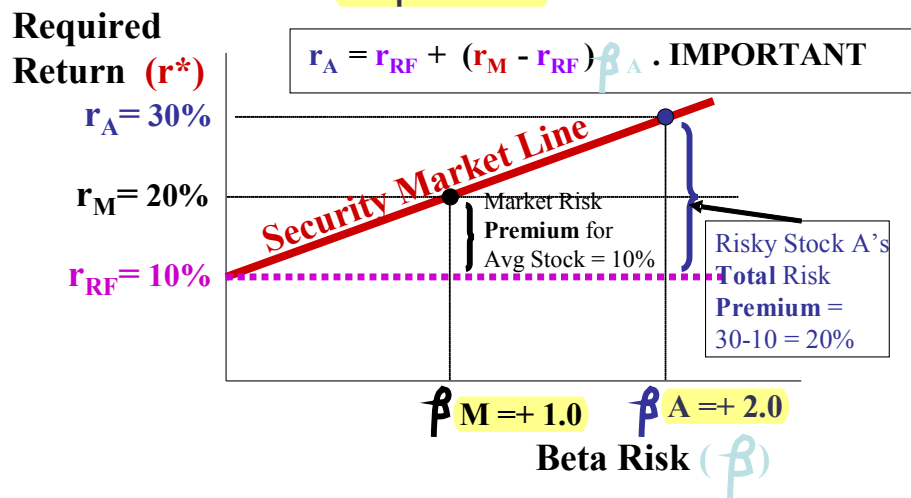
Important



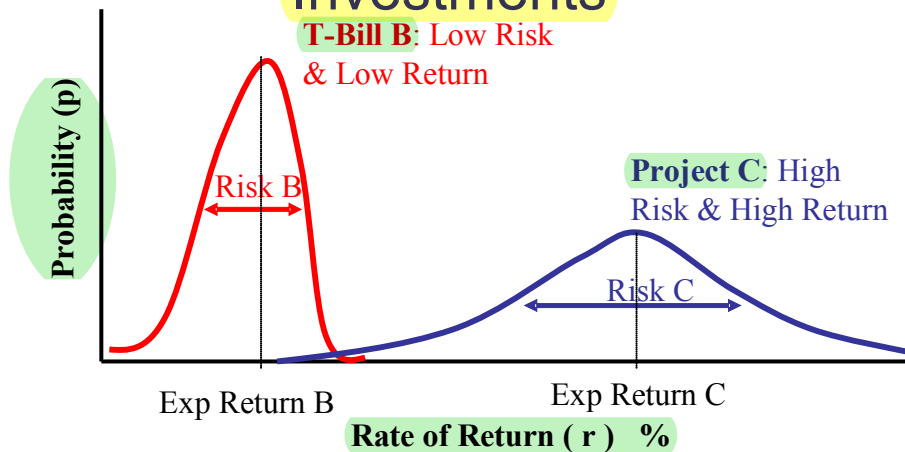
Security Market Line (SML)

ALL Efficient Stocks in Efficient Markets

Important



Combined Risk & Return Graphical Comparison of Investments

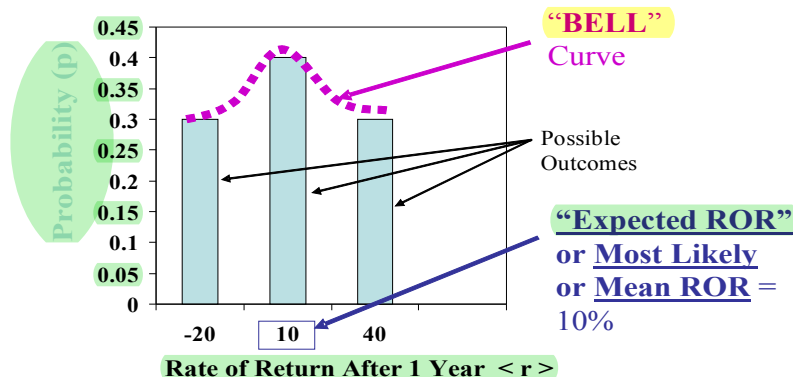


– Entire Firm

- Return - $ROA = (NI + \text{Interest}) / (D+E)$ or $ROE = NI / E$
- Risk - Standard Deviation in ROE (stand alone), FIRM BETAS (market Risk)
- Firm's Overall Level of Risk = Business Risk + Financial Risk
 - Business Risk caused by changes in price and cost of raw materials and products and Operating Leverage
 - Business Risk and Operating Leverage
 - $(OL = \text{Fixed Costs} / \text{Total Cost})$. OL can be good if Sales > Breakeven Point
 - Financial Risk, Financial Leverage:
 - Financial Risk caused by Financial Leverage or Debt
 - $(FL = \text{Debt} / \text{Total Assets} = D / (D+E))$. FL can be good if EBIT / Total Assets > Cost of Debt

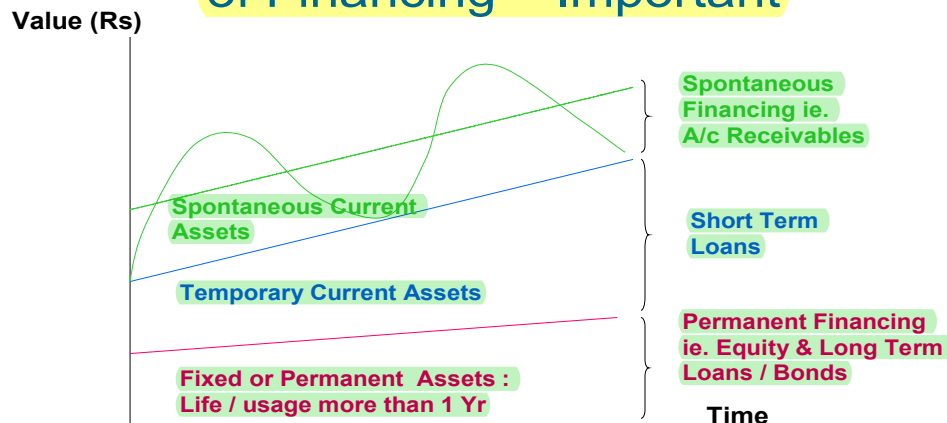
Probability Distribution

Many Possibilities for Forecasted **Returns** of
Single Stock – Uncertainty & Risk



5- Capital Structure and Corporate Financing - Long Term LIABILITIES Side of Balance Sheet

Maturity Matching or Hedging Principle of Financing – Important

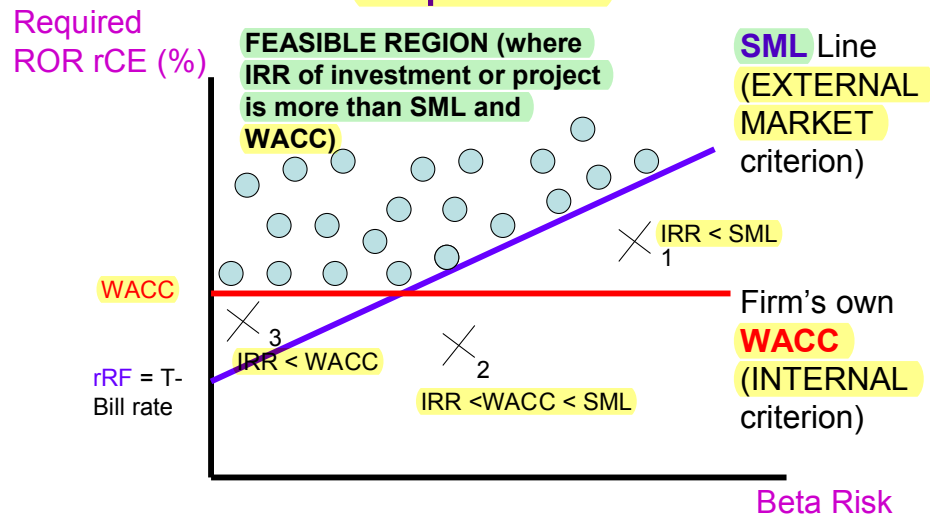


Buy Permanent Fixed Assets with Permanent Financing. IMPORTANT

- Objective: To maintain best balance of Debt & Equity Capital
- Cost vs. Required Return- Net Proceeds, After-Tax Cost of Debt , Source of Equity
 - Compute Cost using Net Proceeds: $NP = \text{Market Price (Po)} - \text{Issuance Costs}$
 - After-Tax Cost of Debt: $r_D (1 - T_c)$
 - Source of Equity: Retained Earnings cheaper than Fresh Stock Issuance in Stock Market
- WACC (%) - Use MARKET VALUES of Debt and Equity,
- **FIRMS TRY TO MINIMIZE THEIR COST OF CAPITAL**
 - $WACC = r_D x_D + r_E x_E$. IMPORTANT FORMULA
 - r_D and r_E are “Costs” of Debt & Equity respectively. INTEREST is the cost paid by Firm to Investors who hold Firm’s Debt. DIVIDEND is cost paid by Firm to Investors who hold Firm’s Equity.
 - x_D and x_E based on MARKET VALUES of Debt and Equity,
- Firm Value = Value = Debt + Equity
= Share Price x Number of Shares Outstanding
- **Two ways to compute:**
NI (or EBIT) Approach ($E = NI / r_E \rightarrow V = E + D$) and Tax Shield (or NOI) Approach ($V_L = V_U + T_c D \rightarrow E_L \rightarrow r_E \rightarrow WACC$)
VL is Value of Levered Firm. VU is Value of Un levered Firm. Tc is Corporate Tax %. D is Debt.

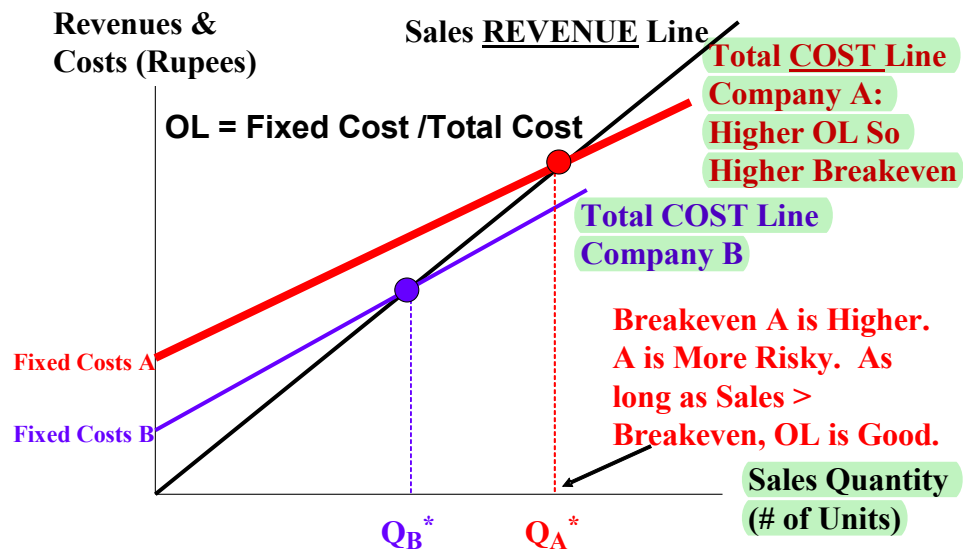
SML – WACC Graph

Important



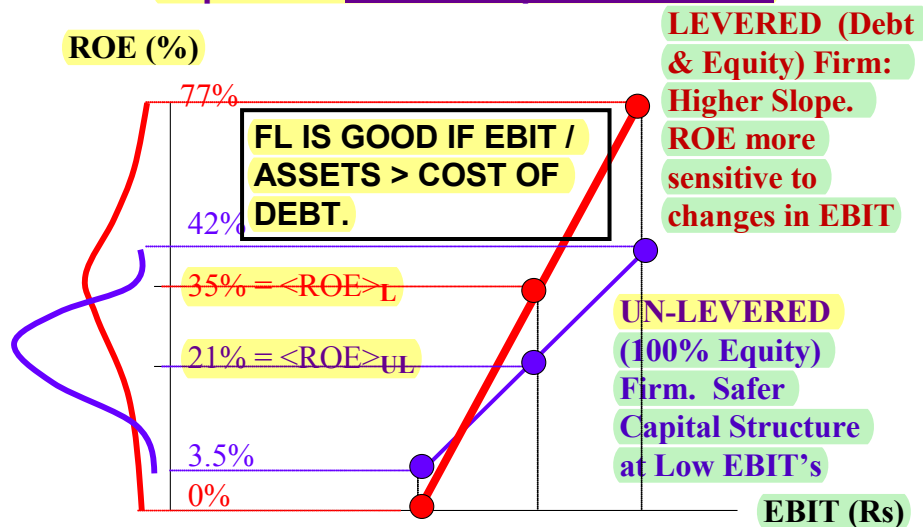
Visualizing Operating Leverage (OL)

Impact on Breakeven Point & Capital Budgeting



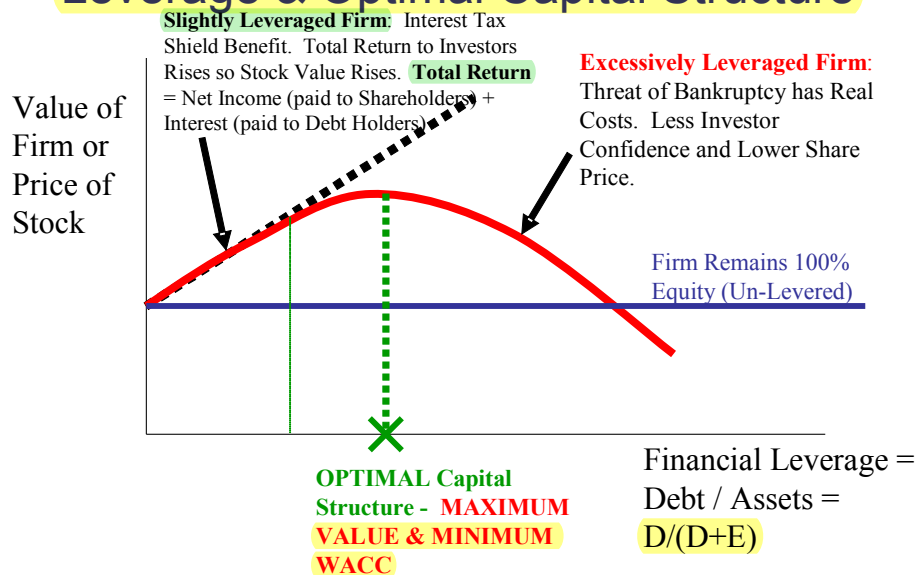
Visualizing Financial Leverage (FL)

Impact on ROE & Capital Structure



Tradeoff Theory Graph

Leverage & Optimal Capital Structure



Capital Structure Theories:

- Tradeoff Theory: Little Debt reduces WACC. High Debt Bankruptcy Risk
- Signaling Theory: Raising New Debt carries Positive signal to market. Fresh Equity carries Negative Signal
- Agency Theory: Managers' Personal Motives clash with Shareholders' (Owners') Interest

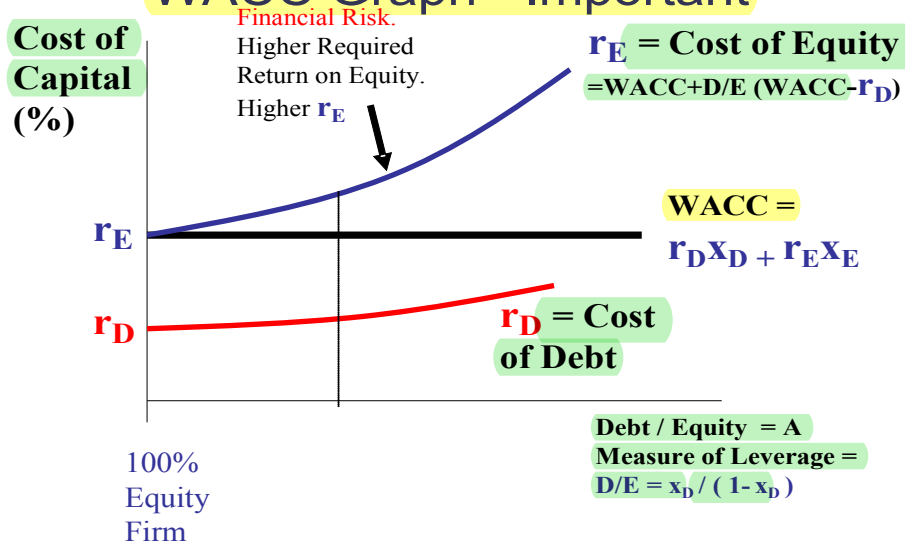
Capital Structure Models

Miller Modigliani

(Without Taxes: $r_E = WACC_U + (D/E)(WACC_U - r_E)$),

Pure MM Theory - Ideal Markets

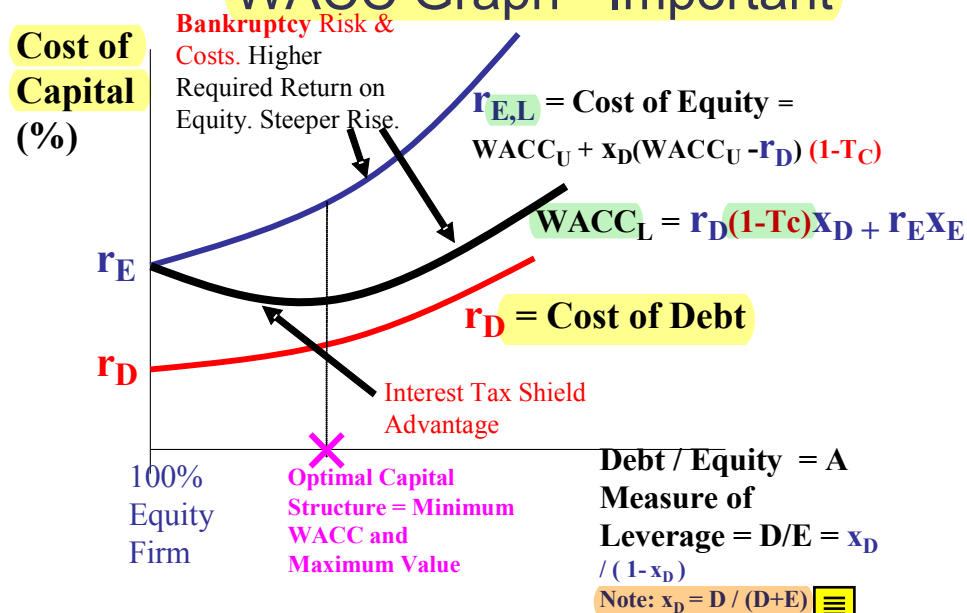
WACC Graph - Important



Market Value of Firm = $V = \text{EBIT} / \text{WACC}$. As Debt Increases, Risk Increases so r_D and r_E and WACC should increase. BUT Debt is cheaper than equity (recall Risk Theory) so as Debt Increases, WACC should decrease! Net Effect is No Change in WACC and No Change in Value. CAPITAL BUDGETING is Independent of Corporate Finance / Capital Structure. **DEBT HAS NO BEARING ON A FIRM'S VALUE!**

Traditionalist Theory - Real Markets

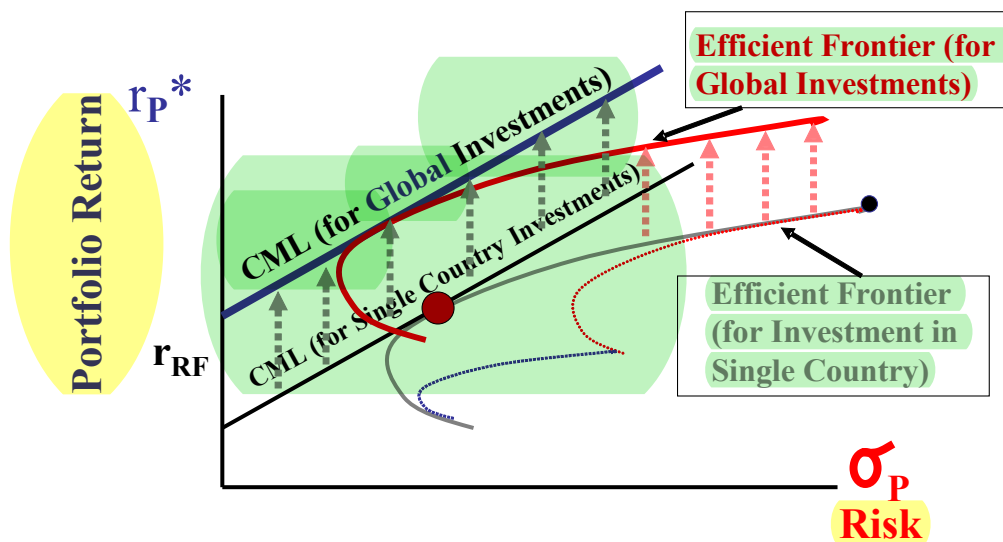
WACC Graph - Important



- **Traditionalists Formulas** ($WACC_L = r_D(1 - T_c)x_D + r_E x_E$)
- **FIRM'S VALUE = EBIT / COST OF CAPITAL. MORE LEVERAGE (OR DEBT) MEANS MORE RISK WHICH MEANS HIGHER COST OF CAPITAL AND THEREFORE LOWER VALUE**
- Traditionalist View is based on Practical Reality. Leverage provides Interest Tax Savings (or Shield) but also Increases Financial Risk. Excessive Leverage leads to Bankruptcy Risk. Increases in Risk will Change Value of Firm and WACC.

- Practical Capital Structure Management- Target Ratios i.e. TIE of 2.5. TIE and Debt / Capitalization
- **Dividend Policy Theories - MM, Signaling, and Agency,**
- $DIV_1 = DIV_0 (1+g)$, $g = P_b \times ROE$, If $ROE < r_E$ then better to give Dividends than to Retain Earnings
 - MM: Dividend Policy and Debt are Irrelevant to a Firm's Value. What matters is the Cash Flows from Underlying Assets and NOT how you divide or split up the Cash Outflows i.e. Dividends. IMPORTANT.
 - Signaling Theory: Issuing New Debt (or taking new loan) gives positive signal to Investors. Issuing Fresh Stock / Equity in Stock Market gives negative signal.
 - Agency Theory: Management's Personal Motives often clash with Owner / Shareholders Objectives
- Impact of Dividend Announcement and Ex-Dividend Date on Share Price
- Dividend Payout restricted by Capital Expenditure Requirement, Target Debt Ratio, and restrictions placed by Debt Contracts
- $DIV_1 = \text{Future Dividend}$
- If $ROE < r_E$ then better to pay out Dividends rather than keep cash as Retained Earnings because company is unable to generate an ROE high enough to satisfy the Shareholder's Required Return (r_E).

Global Investing Makes the Efficient Frontier and the CML (Capital Market Line) Rise Up Higher Return for Same Level of Risk



Outline of 4 Minor Areas of FM:

1- Working Capital and Short Term Financing

- Current Assets Management: Cash, Marketable Securities, Inventory.
 - Current Assets necessary for safe liquidity but earn no / little return on cash, inventory
 - Fat Cat vs. Lean Mean, C/F Synchronization and Cheques Float,
- Current Liabilities and Short Term Financing: Accounts Payable and Short Term Loans. "Spontaneous" and unpredictable source of financing.
- Types of Financing

- Permanent (Equity & Long Term Loan) vs. Temporary (Short-Term Loan) vs. Spontaneous Financing (Current Liabilities). IMPORTANT.
- Hedging Principle or Self-Liquidating Debt or Maturity Matching: Buy Permanent Assets with Permanent Financing. IMPORTANT.

2- Lease Financing

- Financing Lease, Operating Lease, Sale & Lease Back
- Ownership vs. Control
- Valuation of Lease Finance: NAL (modified NPV) and IRR (%)

3- Mergers and Acquisitions (M&A) and Valuation of Firms

- Mergers, Acquisitions, LBO's
- Merger Valuation using DCF (NPV) or MMA Short-cut Formulas
- Impact of Merger on Share Price and Value of Firm

4- International Finance

- Impact on Major Areas of FM: Capital Structure and Corporate Financing, Financial Accounting, Capital Budgeting
- Foreign Exchange (F/x)
 - Markets: Spot, Forward, Futures, Options
 - Relationships: PPP, Fischer Effect, IRP
 - European Convention & Cross Rates

-----THE END-----