

## Lecture # 1, 2, 3

### What is FM?

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

### Why should CS majors study FM?

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. One important area of study is the design, analysis, and construction of financial contracts to meet the needs of enterprises.

### Organizational Structure

#### (Who does the FM work?)

1. Board of director, representative of shareholder or owner of company.
2. CEO : To Him report CFO
3. **CFO:** Handle financial management in centralize way.

AND 2 primary managers:

4. **Treasurer:** handle Cash & Investment, Capital Budgeting, Capital Structure and Inventory.
5. **Controller:** incharge of Accounts, Audit.

### Business Legal Entities

#### • Sole Proprietorship:

It is an unincorporated business owned by one individual

#### Advantages:

- i. It is easily & inexpensively formed.
- ii. It is subject to few government regulations.
- iii. Single taxation.

#### Limitations:

- i. It is difficult for a proprietorship to obtain large sums of capital
- ii. Unlimited personal liability because its effect owner personal assets.

#### • 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.

**Public Limited** (which may be listed on Stock Exchange)

**Private Limited** (Pvt. Ltd.)

#### Advantages:

- i. **Unlimited life:**
- ii. **Limited Liability:**
- iii. **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.

#### Limitations:

- i. **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.

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- ii. **Legal Formalities:** are more complex and time consuming

**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.

**LLP:**

Limited Liability Partnership (LLP) is also a form of partnership with allows limited liability to the owners and avoids double taxation.

**PC:**

Personal Corporations (PC) or Professional Corporations are generally formed by professionals to protect them against litigations

**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

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**Capital Markets:**

These are the markets for the long term debt & corporate stocks. Stock Exchange, Long term bonds

**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.

**Money Markets**

Money market generally is a market where there is buying and selling of short term liquid debt instruments.

**Objective of Economics:** is profit maximization;

**Objective of Financial Management:** is to maximize the shareholders wealth in the present terms by using discounting and the net present value techniques

**Objective of Financial Accounting:** 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.

**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** 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.

**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.

## Real Assets:

Real assets are tangible assets that have physical characteristics

## Securities:

Security, also known as a financial asset, is a piece of paper representing a claim on an asset.

- i. **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.

- ii. **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.

**Bonds:** Internationally, bonds are the most common way for companies to raise funds, shown on the liabilities side of the Balance Sheet. 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).

## Stocks (or Shares):

Stocks (or Shares) are paper certificates representing ownership in a business, represented in the equity section of the balance sheet. **It is the most common source of raising funds under Islamic Sarah**

## Difference between Shares & Bonds:

- i. shares are representation of ownership in a company while bonds are not
- ii. shares last as long as the company lasts where as bonds have limited life
- iii. return on a bond is predetermined and shares not

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## Types of Stocks

### Common Stock:

Common shareholders receive dividends, or portion of the net income which the management decides.

### Preferred Stock:

It is the stock with a predetermined or fixed dividend

The shares and **bonds that a company purchases** as an investment 4 generate extra income will come on the asset side under the section of marketable securities. Those shares and **bonds that the company issues** to raise funds will appear on the liability side. If the **company has issued equity shares**, they will appear under the section of common equity on liability side in the balance sheet.

## 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

## 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.

## 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)

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## Assets + Expense = Liabilities + Shareholders' Equity + Revenue

Left Hand Items increase when debited. Right Hand items increase when credited.

- For every journal entry, **the Sum of Debits = the Sum of Credits**

**a. Balance Sheet:** A financial statement that summarizes a company's assets, liabilities and shareholders' equity at a specific point in time. Balance sheet items or accounts are 'permanent accounts' that continue to accumulate from one accounting cycle to the next.

- **LIMITATION:** Balance sheet neglects any increase in value of assets resulting from inflation and reports assets and liabilities at their book value.

**Solve this problem by**

- **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.
- The balance sheet must follow the following formula:

$$\text{Assets} = \text{Liabilities} + \text{Shareholders' Equity}$$

**Assets (Left Hand Side):** Assets are economic and business resources that are used in generating revenue for the organization:

- They can be tangible (inventory) or intangible.
- 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)

**Current Assets** = Cash + Marketable Securities + Accounts Receivable + Pre-Paid Expenses + Inventory.

**Inventory value** (at any instant in time) is a very controversial figure which depends on **inventory valuation methodology (i.e. FIFO, LIFO, and Average Cost) and Depreciation Method (i.e. Straight Line, Double Declining, and Accelerated).**

**Inventory** can be either raw materials, finished items already available for sale, or goods in the process of being manufactured. Inventory is recorded as an asset on a company's balance sheet.

- **Inventory is the least liquid of all current assets**

**Liabilities (Right Hand Side):**

Liabilities are sources which are used to acquire the resources or liabilities are obligations of two types:

- Obligations to outside creditors and
- 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

**Current Liabilities** = Account Payables + Short Term Loans + Accrued Expenses

**Net Working Capital** = Current Assets – Current Liabilities

**Total Equity** = Common Equity + Paid in Capital + Retained Earnings (Retained Earnings is NOT cash always)

Total Equity represents the residual excess value of Assets over Liabilities:

$$\text{Assets} - \text{Liabilities} = \text{Equity} = \text{Net Worth}$$

**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.

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

Sales revenue – Cost of Goods Sold = **Gross Profit (Revenue)**

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**

- Depreciation is treated as an expense.

### **Cash Flow Statement:**

Statement of cash flows explicitly reflects the cash movement (inflows and outflows) during the operations 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.**

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

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

Increases in current assets are cash payments (-) cash outflow (LHS payments are subtracted)

Increases in current liabilities are cash receipts (+) cash inflow (RHS Receipts are added.)

### **Shareholders' Equity Statement:**

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

$$\text{Total Equity} = \text{Common Par Stock Issued} + \text{Paid In Capital} + \text{Retained Earnings}$$

Retained Earnings is the cumulative income that is not given out as Dividend

- Investments include all cash sale and purchases of non-current assets and marketable securities.
- Financing includes all cash changes in loans, leasing, and equity etc.

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

### **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.

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. 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.

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

Average collection period is usually expressed in terms of days

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### **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.

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

**Return on Assets:** Return on assets is another profitability ratio, which shows the profitability of the company against each dollar invested in total assets.

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

**Return on equity:** Return on equity is of special interest to the shareholders, since equity represents the owners' share in the business.

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

### **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. 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:** 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.

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

### **DEBT (OR CAPITAL STRUCTURE) RATIOS:**

**Debt-Assets:** A commonly used ratio to measure the capital structure of the firm is debt to assets ratio. A ratio greater than 0.66 to 1 is considered alarming for the providers of funds.

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

**Debt-Equity:** explicitly shows the proportion to debt to equity. A ratio of 60 to 40 is used for new projects.

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

**Times-Interest-Earned:** Times-interest-earned reflects the ability of a company to pay its financial charges (interest). A high time interest-earned ratio is a good sign, especially for the creditors. = **EBIT / Interest Charges**

This ratio is obtained by dividing the operating profit by the interest charges.

### **Market Value Ratios:**

Market value ratios relate the firm's stock price to its earnings & book value per share.

#### **Price Earning Ratio:**

It shows how much investors are willing to pay per rupee of reported profits.

$$= \text{Market Price per share} / * \text{Earnings per share}$$

#### **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.

$$= \text{Market Price per share} / \text{Book Value per share}$$

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

$$= \text{Net Income} / \text{Average Number of Common Shares Outstanding.}$$

### **Difference in Focus:**

#### **• 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:**

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.

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

- It is a cumulative measure.
- 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):**

E.V.A focuses on the managerial effectiveness in a given year.

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

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.

## Lec 4 & 5

### 4. TIME VALUE OF MONEY

#### ❖ FM Concepts:

##### 1. Time Value of Money:

- ❖ A rupee today is worth more than a rupee tomorrow.

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

##### 2. Risk and Return

- ❖ A safe rupee is worth more than a risky rupee.

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

##### 3. Discounting & Net Present Value (NPV):

- ❖ Don't compare apples to oranges

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.

##### 4. Portfolio Diversification

- ❖ Don't put all your eggs in one basket.

Portfolio diversification can be a valuable stock investing concept for every investor whose ultimate goal is to maximize profit and minimize risk.

##### 5. Hedging & Risk Management

- ❖ Get insurance because you will break some eggs.

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 tools used to manage risk.

#### ❖ 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.

##### 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

### **Risk Free Interest Rate (RF):**

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

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 Premium is charged by the investor, as compensation, against the risk that the company might goes bankrupt.

### **Maturity Risk Premium (MR):**

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.

The interest rate would be high since the bank would add sovereign risk premium to the interest rate.

### **Liquidity Preference (LP):**

Investor psychology is such that they prefer securities that are easy to in cash. A higher liquidity preference would always push the interest rates upwards.

### **❖ Yield Curve Theory:**

In finance, the **yield curve** is the relation between the interest rate and the time to maturity of the debt for a given borrower in a given currency.

### **Term Structure and Yield Curve:**

Based on the maturity, the securities can be classified into three categories

- i. **Short Term:** Short term means for the period of one year or less.
- ii. **Medium Term:** For the period of any where between one year to five years.



iii. **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:**

In **Nominal**, short term interest rates are lower than long term than interest rates because investors think that inflation is going to increase.

- **Abnormal or downward sloping yield curve:**

It is the case where the short term rates are higher than long term interest rates.

- ❖ **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.

**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.

- ❖ **Types of interest:**

**1. Simple Interest (or Straight Line):** While calculating simple interest we keep the interest and principal separately.

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

**Interest accrued during years on the initial investment:  $(PV \times i \times n)$**

**2. Discrete Compound Interest:** Discrete compound interest is the most commonly used tool in Financial Management Discounting and NPV calculations. The compounding takes place yearly, semi-annually, quarterly, or monthly.

**Annual (yearly) compound:  $FV = PV \times (1 + i)^n$**

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

In order to calculate monthly compounding, the value of 'm' would be 12; however, for quarterly compounding calculation m would be equal to 4

**3. Continuous (or 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

## **5. FINANCIAL FORECASTING AND FINANCIAL PLANNING**

**A financial forecast** is normally an estimate of future financial outcomes for a company.

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.

### **Objectives of Financial Forecasting:**

- 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

### **Methods of forecasting**

#### **Percentage of sales:**

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

- 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.

**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

#### ➤ **GENERAL ASSUMPTIONS**

**Current Assets:** Generally grow in proportion to Sales.

**Fixed Assets:** Do not always grow in proportion to Sales.

**Estimated current assets for the next year**

= [Current assets for the current year/Current sales] x Estimated sales for the next year

**Step 3:** Estimate the Financing Needs (Liabilities)

#### ➤ **GENERAL ASSUMPTIONS**

**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

**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

**Forecast 4 external or discretionary financing**

**Estimated discretionary financing**

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

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

**Return on equity** =net income/ total equity.

**Drawback of Percent of Sales Method:**

1. It is only a rough approximation and is not very detailed.
2. There is a change in fixed assets during the forecasted period the percentage of sales method would not yield a very accurate answer.
3. **lumpy assets** (assets which can only be acquired in large discrete units) are not taken into account

## LEC 6 to 9

### . PRESENT VALUE AND DISCOUNTING

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.

**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”.

**An interest rate can also be understood as an opportunity cost.**

**Why interest rate is called opportunity cost?**

Because, opportunity cost essentially means the cost of taking up one option while sacrificing the other.

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.

**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

**$iper = (i \text{ nominal Interest rate}) / m$**

Where

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

If semi-annual compounding then  $m = 2$

❖ **Effective Interest Rate =  $i_{\text{eff}}$**

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.

**More future cash flow occurs distant in time, the more its present value decreases.**

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

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.

## 7. DISCOUNTING CASH FLOW ANALYSIS, ANNUITIES AND PERPETUITIES

**Cash flow patterns**

❖ **1. 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.

**Example of annuities:**

**Monthly rent, and monthly mortgage payments, or insurance premiums**

**There are two types of annuities**

➤ **Ordinary Annuity**

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

➤ **Annuity Due**

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

**Value of annuity depends on:**

i. Constant Cash Flows

ii. Discount Factor

**Annual Compounding (at end of every year):**

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

$i$ =interest rate,  $n$ =no. of years

**Multiple Compounding:**

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

**Interest rate formula (annually):**

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

**Multiple Compounding:**

**$PV = FV / [1 + (i/m)]^{m*n}$**

**Monthly ( $m=12$ ), Quarterly ( $m=4$ ), Six-monthly ( $m=2$ )**

❖ **2. Perpetuity:**

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

**Future value of perpetuity = constant cash flow / interest rate**

**Example of perpetuity:**

**Retirement plan, Consol Bonds**

**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. These bonds were just like other bonds issued by the government, with the difference that it had no maturity.

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.

➤ **Cardinal principle of Time value of money :**

Cash flows occurring at different points of time cannot be subtracted or added.

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

## 8. CAPITAL BUDGETING AND CAPITAL BUDGETING TECHNIQUES

**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.

**Fixed assets** are the part of long-term assets in the balance sheet.

### Why capital budgeting is so important?

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.

#### ➤ Capital budgeting is a decentralized function:

**Department managers** prepare the budget for fixed assets in coming years, which is quite helpful in capital budgeting.

**Project managers** make the budget for a new project; the cost accountants and assess the expenses to be incurred.

**Market researches** provide their input about the consumer psychology and sales potential.

**The biggest challenge** in capital budgeting is to keep finding the valuable projects. This is possible only by investing in the projects, which have positive net present value, which in effect will increase the shareholders' wealth.

- **Efficient markets** can be described as highly competitive markets where good business ideas are taken up immediately.

### Techniques of capital budgeting (5):

#### ❖ 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. Payback period is a simple and straightforward method for analyzing a capital budgeting proposal.

#### ❖ Return on Investments:

It is an average percentage of investment recovered in cash every year. There are a number of ratios that can be used to analyze return on investment.

$$\text{ROI} = (\Sigma \text{CF}/n) / \text{IO}$$

$\Sigma \text{CF}/n$  = average annual cash flow

#### Limitation with Pay back period, Return on Investments:

- It does not take into account the concept of time value of money.

#### ❖ Net Present Value (NPV):

NPV is a mathematical tool which uses the discounting process. Net Present Value is defined as the value today of the **Future Incremental After-tax Net Cash Flows** less the initial investment.

$$\text{NPV} = -\text{IO} + \Sigma \text{CF}_t / (1+i)^t$$

Where,  $\text{CF}_t$  = cash flows occurring in different time periods

$-\text{IO}$  = 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.

#### ❖ Probability 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.

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

- Profitability index ratio of more than one ( $\text{PI} \geq 1.0$ ) are considered acceptable.

- Those projects, which are ranked as acceptable using the NPV method, would also be acceptable on the profitability index criteria.

❖ **Internal Rate of Return (IRR):**

**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 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

**IRR 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

**IRR Equation:**

$$NPV = -IO + CF1 / (1+IRR) + CF2 / (1+IRR)^2$$

Where NPV = 0

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

**Formula:**

$$NPV = -I_0 + CF_t / (1+i)^t = -I_0 + CF1/(1+i) + CF2/(1+i)^2 + CF' / (1+i)^3 + \dots$$

The project or investment, which is offering the highest NPV, gets the highest rank.

$$PV = NPV + I_0$$

**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.

$$NPV = 0 = -I_0 + CF_t / (1+IRR)^t = -I_0 + CF1/(1+IRR) + CF2/(1+IRR)^2 + \dots$$

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

IRR represents the Break-even Return on Investment.

**Major difference of interpretation of i between NPV and IRR:**

**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'.

**In IRR** project, we do not externally specify the interest rate but we calculated it from the cash flows.

**Graphical techniques** very useful in IRR calculations as there are polynomial equations that are time consuming to solve algebraically in terms of "i".

**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

## Numerical

➤ **CHAPTER# 4: TIME VALUE OF MONEY**

❖ **Example**

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?

**1. Simple Interest (or Straight Line):**

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

$$PV = 100$$

$$n = 5 \text{ year}$$

$$i = 7\% = .07$$

$$FV = 100 + (100 \times .07 \times 5) = 100 + (35)$$



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

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:

- **Annual (yearly) compounding:**

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

$$FV = 100 \times (1+0.07)^5$$

$$FV = 100 \times (1.07)^5$$

$$FV = 100 \times (1.40255)$$

$$FV = 140.255$$

- **Monthly compounding:**

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

$$FV = 100 \times (1 + (0.07/12))^{12 \times 5}$$

$$FV = 100 \times (1 + 0.005833)^{60}$$

$$FV = 100 \times (1.005833)^{60}$$

$$FV = 100 \times 1.4176$$

$$FV = 141.76$$

## 3. Continuous (or Exponential) Compound Interest:

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

$e$  is a constant the derived value of which is **2.718**

$$FV = 100 \times 2.718^{(0.07 \times 5)}$$

$$FV = 100 \times 1.419$$

$$FV = 141.9$$

### ❖ 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?

Solution:

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:

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

## ➤ CHAPTER# 7 : ANNUITIES AND PERPETUITIES

### Example:

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. **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?

Solution:

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

$$= 120,000 [(1+0.2)^2 - 1] / 0.2$$

$$= \text{Rs } 264,000 \text{ (yearly compounding)}$$

**Present value of this future value:**

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

$$= 264,000 / (1+0.2)^2$$

$$= \text{Rs } 183,333$$

So Market Value today of Rs 150,000 and PV = Rs 183,333

$$183333 - 150000 = 33,000$$

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.

**Annuity on a monthly basis:**

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

Now the m= 12 compounding cycle in a year

$$FV_2 = \text{Rs } 292,150$$

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

$$= 292150 / (1 + .2/12)^{2 \times 12}$$

$$= 196,481$$

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 = Rs 2,000,000**

➤ **CHAPTER# 6: 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.

**Cash Outflows** (Cash Payments or Investments) (-)

**Cash Inflows** (Cash Receipts) (+)

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

Net effect of the cash inflows and outflows

$$\text{Net Cash Receipts} = CF_1 = FV_1 = 200,000 - 50,000 - 30,000 = \text{Rs } 120,000.$$

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

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

$$NPV = -I_0 + PV(CF_1) + PV(CF_2) + PV(CF_3) + PV(CF_4) + \dots + \infty$$

$$\text{Present Value of Net Cash Flow from Year 1} = PV(CF_1) = CF_1 / (1+i)^n$$

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

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:

$$NPV = -I_0 + PV(CF_1) = -100,000 + 109,000 = + \text{Rs } 9,000$$

**NPV is +ve**