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Valuation of Securities

The ultimate goal of any individual investor or corporate is maximisation of profits or rate of return. Investment management is an ongoing process which needs to be constantly monitored by way of information as this may affect the value of securities or rate of return of such securities. Therefore, it is necessary to have basic knowledge and understanding of the framework of the security valuation which is essentially based on the conceptual understanding of Time Value of Money and risk return relationship.

The key inputs to the valuation process are:

1. Expected returns in terms of cash flows together with their timing and,
2. Risk in terms of the required return.

The value of an asset depends on the return (cash flow) it is expected to provide over the holding period. The cash flow stream can be annual, intermittent and even one-time. In addition to the total cash flow estimates, their timing/ pattern is also required to identify the return expected from a bond or share.

The Required Rate of Return is used in the valuation process to incorporate risk into the analysis or exercise. Risk denotes the chance that an expected outcome would not be realised. The level of risk associated with a given cash flow/return has significant bearing on its value, that is, the greater the risk, the lower the value and vice versa. Higher risk can be incorporated into the valuation analysis by using a higher required /discount rate to determine the present value.

Securities may be broadly classified into:

1. Non convertible debenture(NCD)
2. Equity
3. Hybrid or Quasi equity instruments

In case of NCD's the future cash flow will consist of periodical coupon payment and principal repayment. In the case of equity, the future cash flow will consist of dividends, and expected Market price on the date of disposal. Convertibles are hybrid which will consist of both types of cash flow.

Whatever be the nature of cash flow, we use the discounted cash flow technique to find out the intrinsic value of a security. According to the DCF technique, the intrinsic value of a security is the present value of the future cash flows discounted at the required rate of return. If the market price of the security is lower or higher than the intrinsic value, the security should be purchased/short sold.

This chapter is divided into following sections:

1. Valuation of Bonds
2. Valuation of Equities
3. Valuation of quasi instruments and convertibles.

Valuation of Bonds

A Bond or Debenture is a long term debt instrument used by Government/Government agency and business enterprises to raise large sums of money. In case of bond, the rate of interest is fixed and is known to the investors. It is redeemable after a specific period. Before going to valuation, it is necessary to familiarise with certain bond related terminology.

Face Value

This is the value stated on the face of the bond and is also known as Par value. It represents the amount of borrowing by the firm which it specifies to repay after a specific period of time i.e., the time to maturity. A bond is generally issued at face value or par value which is Rs.100 and may sometimes be Rs.1000.

Coupon Rate

A bond carries a specific rate of interest which is also called the coupon rate. The interest rate payable is simply the product of the par value of the bond and coupon rate.

Maturity

A bond is issued for a specific period of time. It is repaid on maturity. Typically corporate bonds have a maturity period of 7-10 yrs whereas government bonds have a maturity period up to 20-25 years.

Redemption Value

The value which a bondholder gets on maturity is called the redemption value. A bond may be redeemed at par, at premium (more than par) or at discount (less than par).

Market Value

A bond may be traded in a stock exchange. Market value is the price at which the bond is usually bought or sold. Market value may be different from par value or redemption value.

Valuation of Non-convertible Bond

The intrinsic value of a NCD or a plain vanilla bond is the present value of the future coupon amounts and principal repayment discounted at the appropriate required rate of return.

The investor or the bond holder receives a fixed annual interest payment for a certain number of years and fixed principal repayment (equal to par value) at the time of maturity. Therefore, the intrinsic value or the present value of bond can now be written as:

$$\text{Intrinsic Value } (V_0) = I(PVIFA_{kd,n}) + F(PVIF_{kd,n})$$

Where,	V_0	= Intrinsic value of the bond
	P_0	= Present Value of the bond
	I	= Annual interest payable on the bond
	F	= Principal amount (par value) repayable at the maturity time
	n	= maturity period of the bond
	k_d	= required rate of return

Bond Values with Semi-Annual Interest

Some bonds carry interest payment semi-annually. As half-yearly interest amounts can be reinvested the value of such bonds would be more than the value of the bonds with annual interest payments. Hence, the bond valuation equation can be modified as:

- Annual interest payment i.e., I , must be divided by two to obtain interest payments semi-annually.

- b. Number of years to maturity will have to be multiplied by two to get the number of half-yearly periods.
- c. Discount rate has to be divided by two to get the discount rate for half-yearly period.

With above modifications the bond valuation equation becomes:

$$\text{Intrinsic Value} = I/2(PVIFA_{kd/2,2n}) + F(PVIF_{kd/2,2n})$$

Bond Yield Measures

There are basically three measures of bond yield:

- a. Current Yield
- b. Yield to Maturity (YTM)
- c. Realised yield

Current yield

Current yield measures the rate of return earned on a bond if it is purchased at its current market price and if the coupon interest is received.

$$\text{Current Yield} = \frac{\text{Coupon Interest}}{\text{current market price}}$$

If the coupon rate of Rs.1000 par value bond is 8% , and price prevailing in the market is Rs.800, the current yield of the bond will be,

$$= \text{Rs.80/Rs.800}$$

$$= 10\%$$

It is not representative as it considers only the current cash flow.

Yield to Maturity

It is the IRR of a bond. It is the rate of return earned by an investor who purchases a bond and holds till maturity.

Assumptions Underlying YTM

- a. All coupon and principal payments are made on schedule.
- b. The bond is held till maturity.
- c. The coupon payments are fully and immediately reinvested at precisely the same interest rate as the promised YTM.

Example: Consider a Rs.1000 face value, 10% coupon rate, 5yr bond presently trading at a discount 3% and is redeemable in the 5th year at a premium of 5%. Find out its YTM. Should the investor buy the bond if the required rate of return is 14% p.a?

Sol: There are basically two methods by which YTM can be calculated:

- Trial & Error Method
- Approximation Method

Realised Yield

Realised yield is the yield actually earned by the investor on his investment and depends on the reinvestment rate and the holding period chosen by him.

As mentioned above YTM is based on two unrealistic assumptions that the bond is held till maturity and the intermediate cash flows are reinvested at the promised YTM.

But, people do not necessarily hold bonds till maturity. If the market price goes up or because of urgent need, a person may sell a bond in between.

Interest rates are determined by the demand and supply forces which in turn are influenced by a number of factors. These factors go on changing. Thus if RBI cuts the reserve ratio, the supply of funds go up pulling down the interest rate. So, it is totally unrealistic to assume that all the intermediate cash inflows from the bond can be re-invested at the promised YTM.

Thus, given the actual holding period and the actual re-investment rate, we may compute the realised yield.

Interest Rate risk

It refers to the risk of an investor not realising the promised YTM on account of change in interest rates. As we know that YTM is based on a few assumptions, which do not work in reality.

People generally sell a bond prior to maturity giving rise to price risk. And the rate at which intermediate cash flows are reinvested is uncertain giving rise to reinvestment risk. Thus the interest rate risk has two components:

1. Price risk (Discounting process)
2. Reinvestment risk (compounding process)

There is a holding period where these two forces cancel out each other. This holding period is known as **Macaulay's Duration**.

If a person holds the bond for its duration period, he will be immunised from interest rate risk i.e. he will earn the promised YTM irrespective of change in interest rates.

Computation of Duration

For the purpose of computation, duration may be defined as a holding period where all cash flows from the bond are deemed to be received one shot. Thus duration is a weighted average of the different points of time where cash flows are received, the PV of cash flow acting as weights.

$$\text{Duration} = \frac{\sum Wx}{\sum W}$$

Relationship between Bond price and interest rate

We know that the bond price and interest rate are inversely related. However the relationship between bond price and interest rate is not linear. Instead there is a convex relationship between the two. To be more specific, the percentage increase in bond price for a certain decrease in YTM is greater than the percentage fall in bond price due to the same increase in YTM.

This feature is known as Positive convexity. The convex relation between bond price and interest rate may be approximated by a tangent drawn on the curve. The slope of this tangent shows the percentage change in bond price for 1% change in YTM (ignoring the convexity effect). This slope is known as interest rate risk of bond which is approximately captured by a measure called Modified Duration.

$$MD = \frac{\text{Duration}}{1 + \text{Periodic YTM}}$$

Interest Rate Anticipation

We know that bond prices are inversely related to interest rates. Further long term bonds are more volatile than the short term bonds. Thus if a fund manager anticipates interest rate rise/fall he should tilt his portfolio of bonds towards short term/ long term bond, thereby decreasing / increasing portfolio duration.

Portfolio duration is simply a weighted average of the duration of the bonds in the portfolio i.e.

$$Dp = \frac{\sum WiDi}{\sum Wi} \quad \text{Where,}$$

Wi = investible funds acting as weights.

Di = duration of the bonds

Callable and puttable bonds

A callable bond has an embedded call option which gives the issuer the right to redeem the bond prior to maturity at a predetermined price called the call price (usually at a premium). The company would obviously exercise the call if interest rate falls, so that new bonds can be issued at a lower rate and the proceeds used to retire the old bonds.

Puttable bonds grant the investor a put option (i.e. the right to sell the bond) back to the company prior to maturity.

If a company plans to call the bonds and issue new set of bonds because of the fall in interest rates, this is called as Bond Refunding Decision. Bond refunding decision can be evaluated as a capital budget decision by computing NPV of the bond refunding given by,

NPV = Present values of post tax annual savings – Initial Investment

Floating Rate Bonds

A floating rate bond is one for which the coupon rate is not fixed. Instead, the coupon rate is based on some market rate such as Prime Lending rate (PLR), London Inter-Bank Offer Rate (LIBOR), Mumbai Inter-Bank Offer Rate (MIBOR), etc.

The issuer/ investor of such a bond is of the opinion that the interest rate would fall/ rise. However, to protect themselves from adverse fluctuations in interest rate, the bond typically has a cap (ceiling) & floor (base).

Yield Curves, spot Rates & Forward rates

In finance, the **yield curve** is the relation between the interest rate (or cost of borrowing) and the time to maturity of the debt for a given borrower in a given currency. For example, the U.S. dollar interest rates paid on U.S. Treasury securities for various maturities are closely watched by many traders, and are commonly plotted on a graph such as the one on the right which is informally called "the yield curve." More formal mathematical descriptions of this relation are often called the **term structure of interest rates**.

The yield of a debt instrument is the overall rate of return available on the investment. For instance, a bank account that pays an interest rate of 4% per year has a 4% yield, when the price of the bond equals its par value. In general the percentage per year that can be earned is dependent on the length of time that the money is invested. For example, a bank may offer a

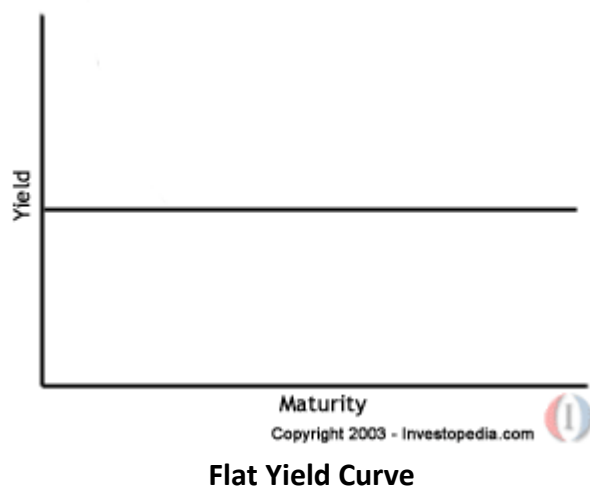
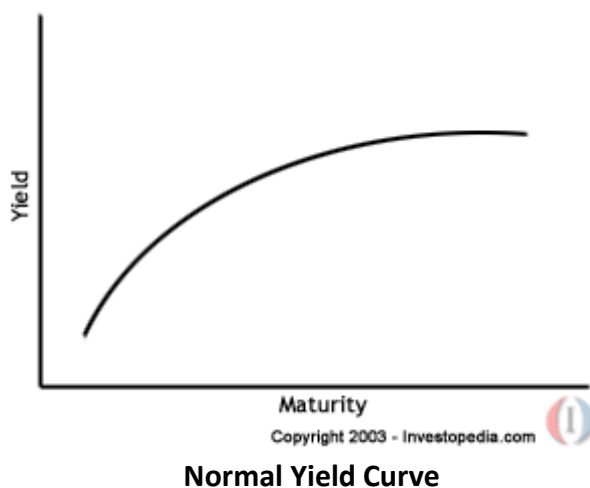
"savings rate" higher than the normal checking account rate if the customer is prepared to leave money untouched for five years.

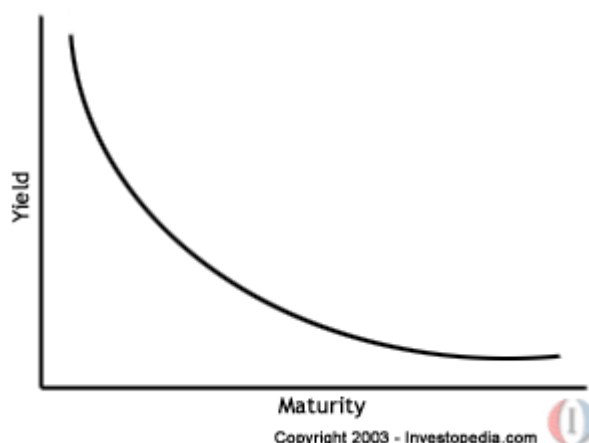
There are basically three shapes that Yield curves can take.

1. Normal Yield Curve
2. Flat Yield Curve
3. Inverted Yield Curve.

Normal Yield Curve : The assumption here is that the economy will grow at a normal rate. In this particular case the investors expect a higher rate of return for longer maturities than shorter maturities. The simple logic behind is that long term maturity bonds are more risky than short term bonds.

Flat Yield Curve: If there may be some signals that short-term interest rates will rise and other signals that long-term interest rates will fall. This condition will create a curve that is flatter than its normal positive slope





Inverted Yield Curve

Inverted Yield Curve: These yield curves are rare, and they form during extraordinary market conditions wherein the expectations of investors are completely the inverse of those demonstrated by the normal yield curve. In such abnormal market environments, bonds with maturity dates further into the future are expected to offer lower yields than bonds with shorter maturities. Some investors, however, interpret an inverted curve as an indication that the economy will soon experience a slowdown.

Spot Rates & Forward Rates

Spot rate:

It is an interest rate for borrowing/ investment today and it is denoted by r_{0n} .

Example: Consider the following information regarding 5 zero coupon bonds of face value 1000 each-

Bond	Maturity	Market Price	YTM
A	1	928	7.76%
B	2	847	8.66%
C	3	735	10.8%
D	4	674	10.37%
E	5	580	11.51%

Forward Rates

It is the rate fixed today for borrowing or investment to take place later on. Spot rates and forward rates should be so structured that there is no arbitrage opportunity.

Example:

Alternative 1- Invest straight away for 2 years at r_{02} p.a

Alternative 2 – Invest for 1 year at r_{01} and contract for the 2nd year at f_{12}

Both alternatives should yield the same result.

$$(1+r_{02})^2 = (1+r_{01}) + (1+ f_{12})$$

i.e. $f_{12} = (1+r_{02})^2 / (1+r_{01}) - 1$

EQUITY VALUATION

Equity stock valuation is a highly uncertain, subjective and imprecise exercise. It is quite challenging, demanding sound judgement and is more qualitative than quantitative. The prospective rewards from this asset class (as is empirically proved) acts as a stimulus to carry out this challenging task. However, risk and return go hand in hand. Thus, the importance of equity valuation as a part of fundamental analysis (to be dealt with later) can never be overemphasized. Equity stock valuation can be carried out in two ways:

1. Absolute Valuation Approach
2. Relative Valuation Approach
3. Residual Valuation Approach

Absolute Valuation Approach

This involves finding out the intrinsic value of a stock with the help of the information relating to the stock. If we are valuing a firm from a minority perspective, we use the Dividend Discount model (DDM). If we are valuing a firm from a control perspective, we use Free Cash Flow for Equity approach.

A. Dividend Capitalization approach or Dividend Discount Model (DDM): Intrinsic value of the share = P.V. of expected future dividends plus the present value of the resale price expected when the equity share is sold, discounted at the equity capitalization rate.

Based on the expectations of dividend, there can be different models:

a) Constant Dividend model: This model assumes that the company is not ploughing back any profits. It is following a 100% dividend payout policy, resulting in no growth. So,

$$V = \frac{D}{Re}$$

b) Constant growth model: As the name suggests, DPS (Dividend Per Share) grows at a constant rate forever. So,

$$V = \frac{D_1}{(Re - g)}$$

c) Multiple Growth models: As the name implies, this model involves differential growth rates in different years. Normally we have the three stage DDM in which there is initial period of supernormal growth, followed by a transition phase during which growth rate falls in a linear fashion, so as to become constant thereafter forever.

$$V = \frac{D_1}{(1+Re)} + \frac{D_2}{(1+Re)^2} + \dots \dots \dots to \infty$$

- V = value of the share
- D1 = expected dividend a year hence
- Ke = required rate of return on the equity share

Note:

- Calculation **Required rate of return**

Under the CAPM approach, it is assumed that the investors hold the diversified portfolio in which Unsystematic Risk is negligible. So, they want compensation only for the Systematic Risk (captured in terms of β). Thus,

$$R_e = R_f + (R_m - R_f) \beta_e$$

- Calculation of growth 'g'

a) 'g' can be calculated as a **CAGR of DPS, EPS, PAT or Sales.**

Example: X Ltd.'s DPS for the last few years are given below:

Year	1	2	3	4	5
DPS	14	16	18	15	17
Bonus Issue				1:2	

If the risk free real rate of return is 5%, expected inflation is 3% and the market risk premium is 7%, Find out the intrinsic value of the stock, having a β of 1.8 (assume that the growth rate implied by the DPS will continue forever).

b) **Sustainable growth Rate:** It may be defined as the growth rate, which the company can attain without resorting to external finance. This may be interpreted in two ways:

- It is the growth rate, which the company can achieve only with the help of retained earnings. Therefore, $g = br$ where, b = retention ratio, r = return on equity
- It is the growth rate, which the company can achieve with the help of retained earnings and that level of debt- equity ratio as earlier.

$$g = \frac{m(1-d)A/E}{\frac{A}{S} - m(1-d)A/E} \text{ where,}$$

m = Net profit margin

d = Dividend Payout ratio

A = Total assets

E = Net worth

S = sales.

B. Free Cash Flow Method:

For a firm that does not pay dividends, the present value of operating cash flow or the free cash flow to equity are often used for calculating a value. In mergers and acquisitions, an acquirer is generally not interested in the dividend policy of the target. So, DDM is not applicable when valuing a firm from a control perspective. In such cases we use the Free Cash flow approach.

It is basically an application of NPV method. We know that NPV of a project is given by-

NPV = Present Value of net cash flows – initial investment

However in a firm, investments take place every year. We therefore define FCFF as the cash flows available to the firm after meeting its investment requirement.

Value of the firm (Debt+ Equity) is therefore defined as the PV of the FCFF discounted at K_c .

$$\text{I.e. } V = \frac{FCFF_1}{1+K_c} + \frac{FCFF_2}{(1+K_c)^2} + \dots \dots \dots \text{to infinity}$$

The overall capitalisation rate i.e. k_c is given by –

$$K_c = W_d K_d + W_e K_e \text{ (Everything in post tax terms)}$$

$$FCFF = NOPLAT - \text{Net Investment}$$

NOPLAT i.e. Net Operating Profit less adjusted tax

$$= EBIT (1 - t)$$

$$\text{Net Investment} = \text{Capital spending} - \text{Depreciation} + \text{change in working capital}$$

$$\text{Value of Equity} = \text{Value of Firm} - \text{Market value of Debt}$$

Relative Valuation Approach

This approach attempts to find out the intrinsic value of a share on the basis of how similar companies are valued. The focus of valuation could be Earnings Per Share (EPS), Sales Per Share or Book Value Per Share (BVPS). Accordingly, there are three valuation formulas:

- P/E ratio approach.
- P/S ratio approach
- P/B ratio approach

A detailed understanding of P/E ratio is called for:

P/E ratio approach: The actual P/E ratio of a company is mathematically given by MPS/EPS .

Consider X Ltd. has an EBIT of 40lakhs. It has a debt of Rs. 120lakhs at an interest rate of 12%. Tax rate = 30%. If the number of shares is 20,000, find its P/E ratio at the current market price of Rs.800.

$$PAT = (EBIT - I) (1 - t) = (40 - 14.4) (1 - 0.3) = 17.92 \text{ lakhs.}$$

$$EPS = 17.92 / 20,000 = 89.6$$

$$P/E \text{ ratio} = 800 / 89.6 = 8.93$$

This means that the companies' share is presently trading at 8.93 times its EPS. However, to compute the intrinsic value of a share, we require the **intrinsic P/E ratio of the firm**.

The P/E ratio of a firm is a function of infinite factors. Any positive/ negative aspect for a firm results in the firm having a higher/ lower P/E ratio, compared to its peers.

The estimation of intrinsic P/E ratio is subjective.

- P/E ratio can also be calculated with the help of a simple or multiple regression equation e.g.

$$P/E = 2 + 0.8g - 0.1\beta$$

Alcar Approach

This approach is an application of the FCFF approach. We have to find out the value of a business strategy given by-

Post Strategy Value – Pre strategy value

Pre- Strategy Value: If the firm maintains status quo (doing nothing) the firm behave like a no growth firm. Its capital spending will be offset by depreciation and there will be no change in working capital. In other words, net investment = nil and therefore $FCFF = NOPLAT$.

$$\text{So, Pre-strategy Value} = \frac{NOPLAT}{K_c}$$

Post- strategy value: This would involve super normal growth phase followed by no growth.

Stage -1 Supernormal Growth: we would be provided with the growth rate of sales. Since margins and turnover ratio would be said to remain the same, the growth rate of sales is applied to NOPLAT as well as capital employed (FA +CA – CL)

The change in capital employed is net investment which when deducted from NOPLAT gives FCFF for each year.

Stage -2 No Growth – Value of the firm at the end of stage 1

$$\text{Horizon value} = \frac{\text{NOPLAT}}{Kc}$$

So, Post –strategy value = PV of the FCFF for stage 1 + PV of the horizon value

Valuation of Hybrid or Quasi Instruments

There are certain instruments which possess the features of both debt and equity and are therefore, correctly classified under the head 'Hybrid or Quasi Instruments'.

From a corporate Finance perspective, hybrid instruments tend to mitigate the agency costs. An agency cost refers to the conflict of interests between the shareholders and debt providers of a company.

Hybrid instruments are product of financial engineering. From the company's point of view the lower costs of funds. From an investor's perspective, they allow a debt holder to participate in the equity appreciation of a company. Two popular hybrid instruments are:

- a) Convertibles
- b) Warrants

Convertibles

Convertible bonds (PCD or FCD) are hybrid or quasi equity instruments having both the debt and equity features. Till the time they are converted, coupon income is paid on the same. On conversion, investor gets the shares. So, the coupon rate on such debenture is normally lower than the coupon rate on non- convertible bonds. Still investors may buy the same if they expect the share price to go up.

Value of PCD = PV of Coupon Income + PV of Non Convertible Redemption Amount + PV of Shares (when sold) + PV of the value of dividend received.

Example: FV = Rs.200, Coupon Rate = 10%p.a. payable at the end of each year. Issue price = Rs.220, Maturity = 5 yrs. The face value of Rs.200 is comprised of two parts.

- a) 40% of the F.V. is non- convertible and shall be redeemed at a premium of 2% at the end of 5th year.
- b) The remaining 60% of F.V. shall be converted into 3 shares at the end of 3rd year.
In the year just ended, the company had an EPS of Rs.8. This is expected to grow @ 12% p.a. for the next 5 years. The company's share is expected to trade at 5 times its EPS at the end of 5th year. The last payout ratio was 10% and this is expected to increase steadily in a linear fashion so as to become 40% from the 5th year onwards.
If the required rate of return is 18% p.a., find out the intrinsic value of convertible bond and advice the investor. (Assume that the shares would be sold at the end of 5th year).

Warrants

Warrants are attached to NCD's to make them attractive. Warrants entitle the bond holder to apply for a certain number of shares at a certain point at a predetermined price called the Strike price or Exercise price (E). Thus, the warrant is basically a right to buy without having an obligation to do so. It is, therefore, similar to call option but the following difference exists:

- Call Options are traded on the stock market, warrants are not.
- Call option is a separate instrument, while warrants are always issued along with the bonds.
- When a call option is exercised the companies cash flows are not affected, whereas, the exercise of a warrant result in cash inflow to the company.
- On the exercise of call option, there is no dilution effect on the exercise of a warrant; the company has to issue additional shares leading to dilution.

Nowadays, we also talk about some additional measures of value creation:

1. **Economic Value Added (EVA):** it may be defined as the surplus left after making an appropriate charge for the capital employed in the business. Thus,

$$EVA = NOPLAT - Kc * capital\ employed$$

$$EVA = (r - Kc) * capital\ employed$$

Where, r = post- tax returns on capital employed

Instead, $EVA = PAT - Ke * equity$

From the above formulas, we find that there are 3 basic components of EVA i.e.

- a) NOPLAT
- b) Cost of capital
- c) Capital employed

Market Value Added (MVA)

It is defined as the difference between the current market price of the firm and capital employed of the firm. Thus, if the market value of the firm (equity and debt) is 40000 and its capital employed is 34000, its MVA is 6000. Thus, MVA is simply the present value of all the future EVAs.

$$MVA = EVA\ 1 / (1 + Kc) + EVA\ 2 / (1 + Kc)^2 + \dots$$

Thus, value of a firm = Capital Employed + MVA

Example: A firm presently has a net worth of Rs.50 lakhs and it has a long-term outstanding debt of Rs.30 Lakhs. The interest rate on debt is 14%. The firm's marginal tax rates 30% and equity capitalization rate of 18%. The firm's expected EBIT for the next year is Rs.24 Lakhs. Find out the EVA for the next year?

Technical Analysis

Technical analysis is a financial term used to denote a security analysis discipline for forecasting the direction of prices through the study of past market data, primarily price and volume.

It is a method of share price movements based on a study of price graphs or charts on the assumption that share price trends are repetitive, that since investor psychology follows a certain pattern, what is seen to have happened before is likely to be repeated. For sums point of view, we need to study,

1. Simple Moving Average (SMA)
 2. Exponential Moving Average(EMA)
 3. Relative Strength Index (RSI)
 4. Stochastic
 5. Advance – Decline line (A- D Line)
-

Security Analysis – Question Bank

Valuation of Bonds

1. Consider a 12% Rs 100000 face value 10 year bond presently trading at 91750. Ten year Treasury Securities are presently yielding 9%. The yield spread (additional risk premium) applicable for different ratings is shown below:

Ratings	AAA	AA	A	BBB
Spread over Treasury (%)	1.5%	2.5%	4%	5%

The bond under consideration has an A rating. Find out the intrinsic value and give your investment advice.

2. Consider a two year Rs 1000 face value 10% coupon rate bond which pays coupon semi-annually. Find out the intrinsic value of the bond if the required rate of return is 14% p.a compounded semi-annually. Should the bond be purchased at the current price of Rs 965?
3. Consider a three year corporate bond of face value Rs 1000 and coupon rate = 12% p.a. payable annually. The bond is redeemable at par at the end of 3 years. The bond is presently selling at Rs 957. If the required rate of return is 13%. Find out the intrinsic value and give your investment advice.
4. If we have 12% Rs 1000 face value 10 year bond presently trading at a discount of 3%, redeemable at a premium of 5% and paying coupon semi-annually. Find out Ytm.
5. Consider the following data regarding the bonds issued by Neha Ltd. On March 15, 2003 to be redeemed on March 15, 2010.

Face value of the bond	Rs 100
Issued at a discount	10%
Redeemable at a premium of	10%
Interest payable semi annually	8% p.a.
Current market price as on march 15, 2005	Rs 95

What is the yield to maturity of the bond to the prospective investor?

6. Consider a 14% Rs 1000 face value 5 year bond presently trading at 970.
- i. Compute its YTM and interpret the same.
 - ii. Compute its Duration and interpret the same.
 - iii. Prove that Duration is the immunising period.
 - iv. Which investor should buy the bond?
 - v. Also compute Price Volatility.

7. Find out the duration of a two year Rs 1000 face value 10% coupon bond presently trading at 985 and which pays coupon semi- annually.
8. A bond with a face value of Rs. 100 provides 12% annual return and pays Rs. 105 at the time of maturity, which is 10 years from now. If the investors' required rate of return is 13%, at what price should the company issue the Bond?
9. A company is offering a bond with the following features:-
 Issue Price = Rs. 100
 Coupon Rate (annual Payment) = 12%
 Maturity = 5 Years
 If the bond is to be redeemed at premium of 20% find out the post tax YTM given income tax rate 30% and capital gains tax rate 10%.

10. Based on credit rating of bonds, Mr. X has decided to apply the following discount rates for valuing bonds -

CREDIT RATING	DISCOUNT RATES
AAA	T Bill Rate + 3%
AA	AAA + 2%
A	AAA + 3%

He is considering to invest in a 15%, 5 Year AA rated bond presently selling at Rs. 1025.86 (FV-Rs.1000)

- Calculate the intrinsic value of the bond given that Treasury bill rate is 8%.
- Calculate the current yield and YTM of the bond.

11. Mr. Rama Raju is planning to invest in a debenture whose face value is Rs. 100 maturing in four years from now. The bond carries coupon at 14.25% payable annually and is presently trading at Rs. 95. Rama Raju wants that the percentage change in the price of the bond should not be more than 5% for each percentage change in the interest rates. You are required to determine whether the bond is suitable for Mr. Rama Raju or not.

12. Consider a 12% Rs. 1000 F.V. 7 year bond redeemable at a 10% premium in 4 equal annual instalments at the end of the 4th, 5th, 6th & 7th year. If ROR is 15% p.a., Find out the intrinsic value & give your investment advice at the current market price of 910.

13. Consider a 12% Rs. 1000 F.V.3 year bond which pays coupon quarterly & is redeemable at a 5% premium at the end of 3 years. The bond is selling at par. Find out the intrinsic value of the bond if the ROR is 12% p.a. compounded quarterly.

14. Consider 10% Rs.1000 FV bond presently trading at par & having a maturity of 5 years. Find **Macaulay's Duration** & interpret the same.

15. Consider a 12% Rs. 1000 FV, 5 year bond presently trading at Rs. 970

- i) Compute its YTM
- ii) State the limitation of YTM
- iii) Compute Macaulay's duration
- iv) Prove that Macaulay's duration is the immunising period

a. Case I- Investor buy the bond and sell it at the end of 4 years. Immediately after buying the bond, interest rate in the market falls to 11%.

b. Case II- Investor buys the bond and sells it at the end of 4 years. Immediately after buying the bond, interest rate in the market rises to 13%.

16. The following data is available for a bond:

Face Value	Rs 1000
Coupon rate	16%
Years to maturity	6
Redemption value	Rs 1000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if there is an increase in required yield by 75 basis points.

17. The Investment portfolio of a bank is as follows:

Government Bond	Coupon Rate(%)	Purchase rate(FV= Rs 100/ bond)	Duration (years)
G.O.I. 2006	11.68	106.50	3.50
G.O.I. 2010	7.55	105.00	6.50
G.O.I. 2015	7.38	105.00	7.50
G.O.I. 2022	8.35	110.00	8.75
G.O.I. 2032	7.95	101.00	13.00

Face value of total investment is Rs 5 crores in each bond.

- a. Calculate actual investment in Portfolio.
- b. What is a suitable action to churn out investment portfolio in the following scenario?
 - i. Case I- interest rates are expected to lower by 25 basis points.
 - ii. Case II- Interest rates are expected to rise by 75 basis points. Also calculate the revised duration of investment portfolio in each scenario.

18. Consider the sovereign yield curve,

$$\text{Given } r_t = 9 + n/10$$

Find out the intrinsic value of a 12% Rs 1000 face value 3 year Government bond.

19. From the following data for Government securities, calculate the forward rates:

Face value (Rs.)	Interest rate	Maturity (year)	Current Price (Rs)
100000	0%	1	91500
100000	10%	2	98500
100000	10.5%	3	99000

20. The following is the yield structure of AAA rated debenture:

Period	Yield (%)
3 months	8.5
6 months	9.25
1 year	10.50
2 years	11.25
3 years and above	12.00

Based on the expectation theory calculate the implicit one year forward rates in year 2 and 3.

If the interest rate increases by 50 basis points, what will be the percentage change in the price of the bond having a maturity of 5 years? Assume bond is fairly priced at the moment at Rs 1000.

21. Following are the yields on zero coupon bonds:

Maturity (years)	YTM
1	10%
2	11%
3	12%

Assuming that the expectations hypothesis of term structure holds good, you are required to,

- Calculate the implied one year forward rates and prices of the Zero coupon bonds having a face value of Rs 1000.
- Calculate the expected yield to maturities and prices of the zero coupon bonds having a face value of Rs 1000.
- Calculate expected total return on two bonds, if you have purchased two year and 3 year zero coupon bonds and held for a period of one year.
- Calculate the current price of a 3 year bond having a face value of Rs 1000 with a coupon rate of 11%. If you buy this bond at the current price and hold for one year, what is the expected holding return?
- Implied 1 year forward rate in this sum means f_{12} and f_{23} .

22. Consider a 15% Rs 1000 face value 5 year par bond presently trading at a discount of 4% and redeemable at a premium of 2%. The bond is callable at the end of 3 years at a premium of 5%. Find-

- YTM & YTC
- DTM & DTC

c. MDM & MDC

23. It is now January 1, 2009. And Mr. X is considering the purchase of an outstanding Municipal Corporation bond that was issued on January 1, 2007, the Municipal bond has a 9.5% annual coupon and a 30 year original maturity (it matures on December 31, 2037). Interest rates have declined since the bond was issued, and the bond now is selling at 116.575% of par, or Rs 1165.75. Determine the yield to maturity (YTM) of this bond for Mr. X.

24. Newchem Corporation has issued a fully convertible 10% debenture of Rs 10000 face value, convertible into 20 equity shares. The current market price of the debenture is Rs 10800, whereas the current market price of equity share price is Rs 480. You are required to calculate,

- i) The conversion Premium
- ii) The conversion value

25. ABC Ltd has the following outstanding bonds.

Bond	Coupon	Maturity
Series X	8%	10 years
Series Y	Variable changes annually comparable to prevailing rate	10 years

Initially these bonds were issued at face value of Rs 10000 with yield to maturity of 8%
Assuming that:

- i) After 2 years from the date of issue, interest on comparable bonds is 10%, then what should be the price of each bond.
- ii) If after 2 additional years, the interest rate on comparable bond is 7%, then what should be the price of each bond?
- iii) What conclusions you can draw from prices of bonds, computed above.

26. Phototech Plc has in issue 9% which are redeemable at their par value of £ 100 in five years time. Alternatively, each bond may be converted on that date into 20 ordinary shares of the company. The current ordinary share price of Phototech Plc is £ 4.45 and this is expected to grow at a rate of 6.5% per year for the foreseeable future. Phototech Plc has a cost of debt of 7% per year.

Required:

Calculate the following current values for each £ 100 convertible bond:

- a. Market value
- b. Floor value
- c. Conversion premium

27. On 1st June 2003 the financial manager of Gadgets Corporation's Pension Fund trust is reviewing strategy regarding the fund. Over 60% of fund is invested in fixed rate long term funds. Interest rates are expected to be quite volatile for the next few years.

Among the Pension fund's current investments are two AAA rated bonds:

- i. Zero coupon June 2018
- ii. 12% Gilt June 2018 (interest is payable semi- annually)

The current annual redemption yield (YTM) on both bonds is 6%. The semi- annual yield may be assumed to be 3%. Both bonds have a par value and redemption value of \$ 100.

Required:

Estimate the market price of each bond if interest rates (yields):

- i) Increase by 1%
- ii) Decrease by 1%

(Given PVF (2.5%, 30) = 0.4767; PVF (3%, 30) = 0.412; PVF (3.5%, 30) = 0.3563)

Valuation of Equities

28. X Ltd. has a 100% payout ratio and is a no growth firm. It has an EPS of Rs 15 for the year just ended and the stock is presently trading at Rs 132. If ROR is 14% p.a. Find out the intrinsic value of the share and comment on its current market price.
29. The required rate of return is 12% p.a. for a stock which is expected to Rs 17 next year as dividend. The dividends amounts are expected to grow @ 4% p.a. forever. Find out the intrinsic value of the share.
30. A firm recently paid a dividend of Rs 8 per share. This is expected to grow @ 6% p.a. forever. Find out the value of the shares if ROR is 14% p.a.
31. X Ltd reported an EPS of Rs 12 for the year just ended and a payout ratio of 40%. The earnings are expected to grow at 30% p.a. for the next 4 years. Beyond the 4th year, growth rate would be 6% p.a. forever. Find out the intrinsic value of the share if ROR is 18% p.a.
32. Consider a firm which paid a dividend of Rs 17/ share. This is expected to grow @ 60% p.a. for the next 3 years. Beyond the 3rd year, the growth rate will start falling in a linear fashion so as to become 4% p.a. from the 7th year onwards and stay at that level forever. Find out the intrinsic value of the share if ROR is 20% p.a.
33. Biogenetics Ltd has paid a dividend of Rs 3.50 per share on a face value of Rs 10.00 in the financial year ended 31st March, 2005. The relevant data regarding the company and the market areas under:

Current market price of share	Rs 75
Growth rate of earnings and dividends	7.5%
Beta of the share	0.95
Average market return	12.5%
Risk free rate	6%

What is the intrinsic value of the share?

34. X Ltd paid a dividend of Rs 12 for the year just ended which represents a payout of 60%. The payout ratio is expected to rise linearly for the next 3 years to become 90% from the 3rd year onwards and stay at that level forever. EPS is expected to grow at a supernormal growth rate of 40% for the next 2 year. Growth rate will then start falling so as to become 4% from the 6th year onward and stay at that level forever. The present beta of the firm is 2. This is expected to continue from the next 2 years and will then start falling in a linear fashion to achieve market beta from the 6th year onwards and stay at that level forever. Given $R_f = 8\%$ and market risk premium = 6%. Find out the intrinsic value of the share.
35. Current share price of Reliance = Rs 480. It has paid a dividend of Rs 15 for the current year. The DPS is expected to remain same for the next 2 years, after which it will grow at a growth rate of 25% p.a. for 3 to 5 years and finally grow at a constant growth rate of 12% forever thereafter. If R_e is 14%, what should be the share price?
36. Richtex Ltd has a current dividend of Rs 1.70 and market value of its common stock is Rs 28. The expected market return is 13% and the risk free rate is 6%. If Richtex stock is half as volatile as the market and the market is in equilibrium, what rate of growth is expected for Richtex's dividends assuming a constant growth valuation model is appropriate for Richtex?
37. AKA's stock is currently selling for Rs 11.44. This year the firm had earnings per share of Rs 2.80 and the current dividend is Rs 0.68. Earnings are expected to grow 7% a year in the foreseeable future. The risk free rate is 6% and the expected market return is 14.2%. What will the effect on the price be of AKA's stock, If systematic risk increases by 40%, all other factors remaining constant?
38. Akashi Optima is a company operating in a mature industry. Presently the EPS is Rs 6.75. Akashi's dividend payout ratio is 60% and ROE is 10% and both of these are expected to be the same in the near future. The beta of the company is 0.86. The Treasury bill rate is 9.86% and the average return from the market is 15.26%. you are required to
- Calculate the intrinsic value of Akashi Optima shares using Dividend Discount Model (DDM).
 - Calculate the intrinsic value of Akashi Optima shares using DDM while considering that the company acquires another company and as a result dividends grow at 20% for the next three years and return to the constant historical rate from 4th year.
39. EC Limited, a manufacturer of electronic cards, is a listed company. The current stock price of the company's stock is Rs 160 per share. The earnings and the dividend growth prospects of the company are disputed by analysts. Mr. R. Ramamurthy is forecasting a growth of 7.50% forever. However, Mr S. Prabhu is predicting a 25% growth in dividends for the next three years after which the growth is to decline to a level of 5% p.a forever. The current

dividend per share is Rs. 11 and stocks of company's of similar risk are currently priced to provide 14% expected return.

You are required to calculate,

- i. The intrinsic value of EC Ltd. share based on the projection of Mr. R. Ramamurthy.
- ii. The intrinsic value of EC Limited's share based on the projection of Mr. Prabhu.
- iii. The implied perpetual growth rate assuming that the stock is correctly priced.

40. X Ltd has the following dividend history:

Years	1	2	3	4	5
Dividend (DPS)	10	11	11.5	12.2	13

It is assumed that the sustainable growth rate in future shall be the average growth rate of the past. It has been found that the stock is 50% volatile as the market. 182 Treasury bills are presently trading at 96.4%. Market risk premium is 5.5%. Find out the intrinsic value of the share as per Constant Growth Model.

41. X Ltd reported an EPS of 20 and DPS of 12 for the year just ended. Earnings are expected to grow at a rate of 30% p.a for the next two years beyond which, growth rate will start falling in a linear fashion so as to become 60% from the year onwards and stay at that level forever. The current payout ratio will continue for the next two years and will then start rising in a linear fashion so as to become 90% from the 5th year onwards and stay at that level forever. Find out the intrinsic value of the share.

42. Current stock price – Rs. 50, dividend for the year just ended – Rs 2. It is expected to grow at a supernormal growth rate of 30% p.a for the next three years. if the required rate of return is 20%, determine the expected constant growth rate after 3 years to justify the current market price.

Free Cash Flow approach

43. X Ltd furnished the following financials for the year just ended-

Sales	1200 lakhs
Net Operating Margin	40% (EBIT)
Capital Spending	140 lakhs
Depreciation	25 lakhs
Change in working capital	5 lakhs

The firm has a target debt equity ratio of 0.5. The firm's effective tax rate = 30%. The firm has 4 lakh shares outstanding in the market trading at Rs 1650. The firm presently has 16% long term debt of Rs 350 lakhs (M.V. 340 lakhs). The stock of the firm presently has a beta of 1.5.

All components of FCFE are expected to grow at a constant growth rate of 5% p.a. forever. Find out the intrinsic value of the share as per FCFE approach. Given $R_f = 6\%$ and $R_m - R_f = 5.5\%$.

44. The following details are available with regard to the projected operations of Pragati Limited.

Years	1	2	3	4	5
Sales	120	132	145	159	175
Operating expenses	53	58	62	67	73
Depreciation	11	10	10	12	12

Year	1	2	3	4	5
Investment in current assets at the beginning of the year	6	5	6	7	5
Investment in fixed assets at the beginning of the year	30	20	10	0	0

Year	Post tax non operating cash flows
1	12
3	8
5	22

The company has long term debt carrying an interest rate of 12.5% and has some non-interest bearing current liabilities. The cost of equity capital is 16%. The company does not have any other long term sources of finance. The market value of equity of Rs 50 lakh and the market value of debt is Rs 30 lakh. The effective tax rate applicable to the company is 36%. From the sixth year onwards the free cash flow of the company is expected to grow at the rate of 8% p.a.

You are required to calculate the value of company using the discounted cash flow approach.

Relative valuation

45. The following details are available with regard to Excel Enterprise Ltd. (EEL):

	(Rs. In Lakh)
Sales	600
Corporate Tax	27
Paid Up Equity Share Capital	80
Reserves and Surplus	40
Effective tax Rate	36%

The following details are available with regard to these companies:

	AIL (Rs. In Lakh)	MIL (Rs. In Lakh)	REL (Rs. In Lakh)
Sales	540	580	640

Tax	19.6	22.4	32.4
Paid up Equity Capital	60	80	90
Reserves & Surplus	40	30	60
Market Value of the firm	648	725	896
Effective Tax Rate	35%	35%	36%

The value of EEL has to be determined using the comparable firms approach. It is felt that in the valuation of EEL the weightage of sales, earnings and book value should be in the ratio of 1:2:1.

You are required to determine the value of EEL by the comparable firms approach.

46. An analyst has developed the following model for estimating justified P/E ratio in the cement industry –

$$P/E \text{ ratio} = 6 + 0.7g + 0.2f$$

Where, g is the CAGR of the firms EPS

F is the proportion of floating stock in a firm and hence a measure of corporate governance.

Find out the intrinsic value of a cement firm having an EPS of Rs.18. Its EPS 4 year ago was Rs.12. It has 10 lakh shares outstanding out of which 2 lakh shares are held by the promoters and existing management.

47. A no growth firm presently trades at 8 times its earnings. Gov. Securities are yielding 6% & market risk premium is 5%. If the market return went up by 5%, & the stock return went up by 4%, what is the abnormal return on the stock?

48. Consider the following data relating to two firms –

Particulars	Firm A	Firm B
Growth Rate	8%	5%
ROE	25%	20%
Beta	1.2	1.5
EPS	45	35

- Find out the justified P/E multiple for each firm as per constant growth DDM and highlight the reasons for the difference.
- Find out the intrinsic value of the share of each firm.

Given $R_f = 6\%$ and $R_M = 10\%$

49. Consider a firm with the following capital structure –

Net worth=500 Lakhs

15% long term debt 500 lakhs

The firm is subject to tax rate of 40% and its cost of equity is 17%. For the next year the firm is expected to generate an EBIT of 250 lakhs. Compute EVA and find out the intrinsic values of the share –

Case I: Assuming EVA to be perpetual

Case II: Assuming EVA to be subject to a perpetual growth rate of 5% p.a.

No of shares = 10 lakhs

50. Consider a 10-year, 12% coupon Rs100 face value bond which is convertible into shares at the option of the investor. The bond is presently trading at Rs1190. Similar NCDs are yielding 15%, the share price of Rs.220. If option value is 5% of floor value, find out the intrinsic value of the OCD & comment upon mispricing?
51. SRT Ltd., a market leader in automobile industry, is planning to diversify into other businesses that have recently been opened up by the GOI for private sector. In the meanwhile, the CEO of the company wants to get his company valued by a merchant banker, as he is not satisfied with the current market price of his scrip. He approached a merchant banker with a request to take up valuation of his company with the following data for the year ended 2000:

Share Price	Rs.66 per share
Outstanding Debt	1934 Crore
Number of outstanding shares	75 Crore
Net Income	17.2 Crore
EBIT	245 Crore
Interest Expenses	218.125 Crore
Capital expenses	234.4 Crore
Depreciation	234.4 Crore
Working Capital	44 Crore
Growth Rate	8% (from 2001 to 2005)
Growth Rate	6% (beyond 2005)
Free Cash flow	240.336 Crore (year 2005 onwards)

The capital expenditure is expected to be equally offset by depreciation in future and the debt is expected to decline by 30% by 2005.

52. Following information is available in respect of EPS and DPS of Intelligent for the last five years:

Year	2004	2003	2002	2001	2000
EPS (Rs.)	14.10	13.60	13.10	12.70	12.20
DPS (Rs.)	8.20	8.10	7.90	7.80	7.70

Dividends for a particular year are paid in the same calendar year. If the same dividend policy is maintained, it is expected that the annual growth rate of earnings will be no better than the average of last four years. The risk free rate is 6% and the market risk premium is 4%. With references to the market rate of return, the equity shares of the company have a beta of 1.5 and are not expected to change in near future.

The company has received a proposal from Smart Ltd to acquire its operations by paying the value of shares. You are required to value the equity shares of the company using (i) dividend growth model; (ii) earnings growth model; (iii) capital asset pricing model (CAPM)

53. Classical Equipment (CE) is a leading manufacturer of programmable calculators and it is targeting to acquire Numeric Equipment (NE), a leading manufacturer of scientific calculators. The main motive behind the acquisition by CE is that NE is perceived to be poorly managed and the acquisition of the same will help in managing the firm optimally and increasing its value.

The increase in value after the change in management is technically termed as value of control. Moreover, the acquisition is expected to bring synergies both in terms of cost savings and revenue growth. NE posted operating income of RS.425.14 million and revenues of 15,452 million in the current year. It incurred capital expenditure of 256.45 million and provided Rs. 198.63 million for depreciation purpose. Its working capital requirements are 10% of revenues. Revenues, operating income and net capital expenditure are expected to grow at 8% a year for the next five years. After that, the revenues and operating income are expected to grow at 5% a year forever. However, net capital expenditure is expected to be zero. Currently, beta of its equity shares is 1.2 and debt ratio is 20%. After 5 years, beta is expected to come down to 1. Its cost of debt is 12%.

However, if it is acquired by CE, its revenues, operating income and net capital expenditure are expected to grow at 12% a year for the next five years. Working capital requirements are estimated at 10% of revenues. After 5 years, growth rate in operating income and revenues are expected to stabilize at 7% a year forever and net capital expenditure is expected to be zero. CE is planning to increase debt ratio to 40% and as a result, cost of debt is expected to increase to 12.5%. Its equity beta is expected to be 1.25 during the first 5 years and decrease to 1 thereafter.

Both the companies fall under the tax bracket of 34%. Treasury bills are yielding 6% a year and historically Sensex is generating a premium of 6% a year.

Using free cash flow to firm model, you are required to:

- a) Determine the value of Numerical Equipment under the current Management
- b) Determine the value of Numerical equipment under the management of Classical Equipment.
- c) Determine the value of control.

54. Calculate economic value added (EVA) with the help of the following information of hypothetical limited:

Financial Leverage:	1.4 times
Capital Structure:	Equity Capital Rs. 17 lakh
	Reserves and Surplus Rs.130 Lakh
	10% Debentures Rs.400 Lakh
Cost of Equity:	17.5%
Income Tax Rate:	30%

55. Consider two firms that are similar in all respects other than growth rate –

Particulars	Firm A	Firm B
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Growth Rate	6%	9%
P/E Ratio	14 times	12 times

Comment on market efficiency and advise its trading strategy.

56. Nap. Comm. Plc is a closely held company based in Lincolnshire in B2B business offering logistic services to small and medium sized companies through internet, who cannot afford sophisticated logistics practices. Company is planning to go for public issue in the coming year and is interested to know what the company's share will be orth. The company engaged a consultant based in Leicestershire. The consultant evaluated company's future prospects and made following estimates of future free cash flows.

	Years			
	1	2	3	4
sales	£100000	£115000	£132250	£132250
Operating income (EBIT)	£16000	£18400	£21160	£21160
Less: cash tax payment	(£4800)	(£5520)	(£6348)	(£6348)
Net operating profits after taxes (NOPAT)	£11200	£12880	£14812	£14812
Less: Investments				
Investment in net working capital	(£1695)	(£1950)	(£2242.50)	-
CAPEX	(£2347.83)	(£2700)	(£3105)	-
Total investments	(£4043.48)	(£4650)	(£5347)	-
Free cash flow	£7156.52	£8230	£9464.50	£14812

Further, the company's investment banker had done a study of the company's cost of capital and estimated WACC o be 12%. You are required to determine.

- Value of Nap. Comm. Based on these estimates.
- Market Value Added (MVA) by company supposing that invested capital in the year 0 was £31304.05
- Value of per share, if company has 2000 common equity share outstanding and debt amounting to £ 4000.

57. The existing capital structure of XYZ ltd as under:

Equity Shares of Rs 100 each	4000000
Retained Earnings	1000000
9% Preference Shares	2500000
7% Debentures	2500000

The existing rate of return on the company's capital is 12% and the income tax is 50%. The company requires a sum of Rs 2500000 to finance its expansion program for which it is considering the following alternatives:

- Issue of 20000 equity shares at a premium of Rs 25/ share.
 - Issue of 10% preference shares.
-

Derivatives

A derivative is a financial contract which derives its value from some underlying assets. The underlying assets could be a stock (for example futures on reliance), currencies (dollar futures), stock index, futures on the BSE Sensex, physical commodity (oil futures), interest bearing instruments (T Bill futures) or even weather.

Derivatives help in making the market more liquid and deep, thus, they improve the efficiency of the markets. The reasons for the introduction of derivatives in India may be summarised as follows:-

1. It is in line with international practices,
2. It is a transparent leverage instrument and is, therefore, much more efficient than the age old badla mechanism, allocation of risk, leading to better price discovery,
3. It helps in transferring risk from risk averse to risk aggressive investors. This results in optimal allocation of risk, leading to better price discovery,
4. It helps to provide new types of risk return profile which were never imagined with the help of stock trading,
5. They act as an efficient hedging tool both in the stock and the currency markets.

We will broadly classify derivatives into two categories:-

- (i) OTC, such as forwards and financial swaps,
- (ii) Exchange traded, such as futures and options.

Types of Derivatives

Over the counter

1. Forward Contract
2. Financial Swaps

Exchange Traded

1. Futures
2. Options

Forward Contract

A forward contract or simply a forward is a non-standardized contract between two parties to buy or sell an asset at a specified future time at a price agreed today. This is in contrast to a spot contract, which is an agreement to buy or sell an asset today. It costs nothing to enter a forward contract. The party agreeing to buy the underlying asset in the future assumes a long position, and the party agreeing to sell the asset in the future assumes a short position. The price agreed upon is called the delivery price, which is equal to the forward price at the time the contract is entered into.

Futures

Futures contract is a standardized contract between two parties to exchange a specified asset of standardized quantity and quality for a price agreed today (the *futures price* or the strike price) with delivery occurring at a specified future date, the *delivery date*. The contracts are traded on a futures exchange. The party agreeing to buy the underlying asset in the future, the "buyer" of the contract, is said to be "long", and the party agreeing to sell the asset in the future, the "seller" of the contract, is said to be "short". The terminology reflects the expectations of the parties -- the buyer hopes or expects that the asset price is going to increase, while the seller hopes or expects that it will decrease.

In many cases, the underlying asset to a futures contract may not be traditional commodities at all – that is, for financial futures the underlying asset or item can be currencies, securities or financial instruments and intangible assets or referenced items such as stock indexes and interest rates.

Though futures are very much similar to forward contracts, the following difference exists:

- Futures are standardised while forwards are customised.
- Futures are quoted on the stock exchange while forwards have an over the counter market.
- There is margin requirement in futures. Banks may require margin even in case of forward but that would be situation specific.
- There is marking to market feature in the case of futures. This means that futures contract is re-priced every day, the difference being adjusted in the margin.
- Futures may be cash settled or physically delivered on maturity. But forward contracts are necessarily physical delivered if not cancelled before maturity.
- On account of the stock exchange on one hand and margin requirement on the other, default risk is negligible in futures market.
- Due to stock market quotations, futures are more liquid than forward contracts.

Margin Maintenance

Going long/ short in futures implies contracting to buy/ sell. If there is an adverse movement there is a possibility of default on the part of the trader. To mitigate the same, the clearing house requires every futures trader to make a security deposit called the initial margin. This margin balance goes on changing due to marking to market feature. There is a minimum margin requirement called maintenance margin. If the margin balance on a particular day goes below the maintenance margin, the customer has to bring in an amount called variation margin to achieve the initial margin. Also any amount over and above the initial margin is allowed to be withdrawn. Once the contract is squared off, the margin balance on that is refunded.

Note: the minimum movement in futures price is called one tick. Thus, if the quotation is in four decimal places, One tick = 0.0001. we should compute the profit or loss due to movement of one tick to facilitate calculations.

Most of the futures contracts are squared off before maturity. Thus, open interest (number of contracts not yet squared off) reduces as the maturity approaches.

Relationship between spot price and Futures price

Futures are priced as per the 'cost of carry' model which is based on the prevention of arbitrage principal. As per the model,

Theoretical F = Spot Price + interest saved + Storage cost saved – Convenience yield foregone.

If actual F > Theoretical F, we carry out a 'cash and carry' arbitrage, i.e. buy spot and sell futures.

If actual F < Theoretical F, we carry out a 'reverse cash and carry' arbitrage, i.e. sell spot and buy futures.

Theoretically, F = Spot Price + interest saved – dividend foregone.

Note: In some cases, the cost of carry model is applied in a continuous framework i.e. when interest rates and dividend yield are continuously compounded, we have –

$$F = S * e^{(r-d)t}$$

Stock Index Futures

A stock index is simply a proxy for the market portfolio. It is said to have no unsystematic risk. there might be speculators who are good at forecasting systematic factors which impact the market. To speculate on the same, they may invest in the stock index. Investing in the BSE Sensex implies buying all the 30 shares comprised in the sensex in the same weights in which they are present in the sensex. Obviously this process is very cumbersome and involves significant transaction costs. Hence, the need for Stock Index futures –

These are special type of futures contract where the underlying asset is a well established stock market Index such as the BSE Sensex or the NSE Nifty. The contract size (multiple) for sensex and Nifty are 50 and 200 respectively. Thus, if a person goes short in Nifty futures at 1910 and later on squares off his position at 1780, he makes a gain of $[(1910 - 1780) * 200] = 26,000$. The margin requirements are similar.

Stock Index Arbitrage

As per the cost of carry model –

Fair Value of the Stock Index Futures + Index Value + Interest saved – dividend foregone.

If the actual Sensex futures are different than the fair value, there would be arbitrage opportunities.

Portfolio insurance

Portfolio managers usually hold diversified portfolios. They are therefore, not worried about unsystematic risk (i.e., firm specific risk). However, they are exposed to systematic risk, captured by 'beta'. Thus, if a Fund Manager has a portfolio of Rs.140 lakhs, with a beta of 2.5, it means that, if market falls by 1%, the portfolio will lose value by 2.5%. to hedge the same, he may take a short position in Index futures.

No. of contracts is given by –

$$X = \frac{V_p * (\text{target beta} - \text{existing beta})}{F * M * \text{Future's beta}}$$

Where,

V_p = value of the portfolio,

F = Futures Price,

M = Multiple.

Thus, if Nifty Futures trades at 4050 and the Fund Manager wants to reduce the beta of the portfolio to 0.5,

$$X = \frac{14000000 * (0.5 - 2.5)}{4050 * 100 * 1} \quad (\text{beta of market is 1})$$

= (69) i.e. the fund manager should sell 69 contracts.

Foreign Currency Futures

These are futures on foreign currencies and therefore these can be used for speculating or hedging against currency movements.

Pricing of currency Futures

Currency Futures are priced as per IRP, which incorporates the cost of carry model –

⇒ Use it when no information is given regarding the nature of interest rate.

$$\frac{F}{S} = \frac{1 + niA}{1 + niB}$$

⇒ when interest rate is annualised effective

$$\frac{F}{S} = \left(\frac{1 + iA}{1 + iB} \right)^n$$

⇒ Use if interest rates are continually compounded.

$$\frac{F}{S} = e^{(iA - iB) \times n}$$

Speculation using Futures

Outright Speculation

If Dollar futures are quoted against Rupee, the speculator would sell/ buy dollar futures according to this forecast about dollar depreciating / appreciation against rupee. He has to deposit the requisite initial margin. The cash flow subsequently will depend on the dollar futures prices which being a derivative will depend on the spot price of dollar. It is considered to be a risky strategy.

Instead, the speculator may go for spread trading. This involves simultaneous buying and selling. The spread is defined as buy- sell i.e. x-y. The spread trader is not betting on x or y. Instead he is betting on the difference between x & y.

- 1) Buy \$ futures if you are bullish on dollar

2) Buy \$ futures if you are bearish on dollar

Example: A speculator is bearish on \$ against Re. in India. Currency Futures has started trading and Rupee Futures are trading at \$.0245/ Re. contract for rs.275000 the speculator uses one contract which he squares off at \$.0267. Find out the overall profit or loss in rupee terms. Given spot rate at the time of squaring off is Rs. 46.55/ \$.

Spread Trading

Inter Commodity Spread:

This involves buying and selling futures on different commodities for the same maturity. Thus, if the trader is of the opinion that Dollar would appreciate against pound, he may buy dollar against Rupee and sell Pound Futures against rupee for the same maturity.

Intra Commodity Spread:

This involves buying and selling futures on the same commodity for different maturities. Thus, a trader may buy 1 month \$ Futures and sell 2 month \$ Futures.

Hedging Foreign Currency payable/ Receivable

Earlier, we had covered a foreign currency payable/ receivable through money market or forward market, both examples of perfect hedge.

A foreign currency payable/ receivable may also be hedged via Futures Market. However, futures cover is an imperfect hedge due to –

- 1) Standardization: Due to amount and maturity mismatch.
- 2) Basis risk: Basis is defined as the difference between spot rates and futures rate, i.e. $\text{basis} = S - F$.

As we approach maturity, S & F move closer to each other i.e. basis narrows.

On the maturity date, $S = F$ i.e. basis = nil. The fact that the basis does not remain the same shows that the spot price move unequally, resulting in basis risk.

Relationship between Futures Price and Expected Spot price

There are three theories that explain the relation between F & E(S) –

- 1) Expectations theory – According to this theory, hedgers are neither net long nor short. So, $F = E(S)$.
- 2) Contango – **it** refers to the market condition wherein the price of a forward or futures contract is trading above the expected spot price at contract maturity. The resulting futures or forward curve would *typically* be upward sloping (i.e. "normal"), since contracts for further dates would typically trade at even higher prices.
- 3) Backwardation - Normal backwardation, also sometimes called backwardation, refers to the market condition wherein the price of a forward or futures contract is trading below the expected spot price at contract maturity. The resulting futures or forward curve would typically be downward sloping (i.e. "inverted"), since contracts for farther dates would typically trade at even lower prices. (The curves in question plot market prices for various contracts at different maturities.

Options

An **option** is a derivative financial instrument that specifies a contract between two parties for a future transaction on an asset at a reference price. The buyer of the option gains the right, but not the obligation, to engage in that transaction, while the seller incurs the corresponding obligation to fulfill the transaction. The price of an option derives from the difference between the reference price and the value of the *underlying* asset (commonly a stock, a bond, a currency or a futures contract) plus a premium based on the time remaining until the expiration of the option. Other types of options exist, and options can in principle be created for any type of valuable asset.

An option which conveys the right to buy something at a specific price is called a call; an option which conveys the right to sell something at a specific price is called a put. The reference price at which the underlying asset may be traded is called the strike price or exercise price.

This topic will be done under following heads:

1. Basics of Options. – basic nomenclature associated with options and type of options
2. Application of Options.
 - a) Hedging using options
 - b) Speculation using options
3. Valuation of Options
 - a) Put Call Parity
 - b) Binomial Model
 - c) Black Scholes Model
4. Option Greeks
 - a) Delta
 - b) Gamma
 - c) Vega
 - d) Rho

Swaps

Financial Swaps are an asset- liability management technique which permit a borrower to access one market and then exchange the liability for another type of liability. Investors can exchange one type of asset for another with a preferred income stream in terms of currency, and interest rate fixed or floating. The two major types of swaps are ***Interest rate swaps and Currency swaps.***

Interest Rate Swaps

In this type of swaps, one party agrees to pay the other party interest at a fixed rate on a notional principal for a number of years in return; it receives interest at a floating rate on the same notional principal for the same period of time. Principal amounts are usually not exchanged in an interest rate swap.

An interest rate swap can be used to convert a floating rate loan into a fixed rate loan, or vice versa. It can also be used to transform a floating rate investment to a fixed rate investment or vice versa.

Currency Swap

In a currency swap, one party agrees to pay interest on a principal amount in one currency. In return, receives interest on a principal amount in another currency. In a currency swap, principal amounts are exchanged at both the beginning and end of the life of the swap.

A currency swap can be used to transform a loan in one currency into a loan in another currency. It can also be used to transform an investment denominated in one currency into an investment denominated in another currency.

Motivations behind Interest rate Swaps

1. Quality Spread Differential
2. Hedging interest rate risks (e.g. asset- liability mismatch)
3. Speculation on interest rates
4. Achieving other desired objectives

OTC Derivatives

Over-the-counter (OTC) derivatives are contracts that are traded (and privately negotiated) directly between two parties, without going through an exchange or other intermediary. Products such as swaps, forward rate agreements, and exotic options are almost always traded in this way. The OTC derivative market is the largest market for derivatives, and is largely unregulated with respect to disclosure of information between the parties. Reporting of OTC amounts are difficult because trades can occur in private, without activity being visible on any exchange. Because OTC derivatives are not traded on an exchange, there is no central counter-party. Therefore, they are subject to counter-party risk, like an ordinary contract, since each counter party relies on the other to perform.

In this section we will deal with-

- Forward rate Agreement (FRA)
- Caps, Floors and Collar
- Interest Rate Swaps

Forward Rate Agreements

FRA transactions are entered as a hedge against interest rate changes. The buyer of the contract locks in the interest rate in an effort to protect against an interest rate increase, while the seller protects against a possible interest rate decline. At maturity, no funds exchange hands; rather, the difference between the contracted interest rate and the market rate is exchanged. The buyer of the contract is paid if the reference rate is above the contracted rate, and the buyer pays to the seller if the reference rate is below the contracted rate. A company that seeks to hedge against a possible increase in interest rates would purchase FRAs, whereas a company that seeks an interest hedge against a possible decline of the rates would sell FRAs.

For example, a 3×6 FRA expires in three months; the underlying is a Deposit that begins in three months and ends three months later, or six months from now.

The payment of an FRA at expiration is based on the net difference between the underlying rate and the agreed upon rate, adjusted by the notional principal and number of days in the instrument on which the underlying is based.

The netted payment made at the effective date is as follows,

$$\text{Payment} = \text{Notional Amount} * \left(\frac{(\text{Reference Rate} - \text{Fixed Rate}) * \alpha}{1 + \text{Reference Rate} * \alpha} \right)$$

- The Fixed Rate is the rate at which the contract is agreed.
- The Reference Rate is typically LIBOR.
- ' α ' is the day count fraction, i.e. the portion of a year over which the rates are calculated, using the day count convention used in the money markets in the underlying currency.

Caps, Floor & Collar

Caps, Floors and Collars are option based interest rate risk management products that put limits to the interest rates. A borrower may want to limit the interest rate to avoid any rises in the future and buys a cap. Or investor may buy a floor to avoid any future falls in the interest rates. **Anyone who aims to maintain interest rates within defined range can use the combination (collar).**

Interest Rate Cap

An interest rate cap is actually a series of European interest call options (called caplets), with a particular interest rate, each of which expire on the date the floating loan rate will be reset. At each interest payment date the holder decides whether to exercise or let that particular option expire. In an interest rate cap, the seller agrees to compensate the buyer for the amount by which an underlying short-term rate exceeds a specified rate on a series of dates during the life of the contract. Interest rate caps are used often by borrowers in order to hedge against floating rate risk.

(Current market rate - Cap Rate) x principal x (# days to maturity/360)

Interest Rate Floor

Floors are similar to caps in that they consist of a series of European interest put options (called caplets) with a particular interest rate, each of which expire on the date the floating loan rate will be reset. In an interest rate floor, the seller agrees to compensate the buyer for a rate falling below the specified rate during the contract period. A collar is a combination of a long (short) cap and short (long) floor, struck at different rates. The difference occurs in that on each date the writer pays the holder if the reference rate drops below the floor. Lenders often use this method to hedge against falling interest rates. The cash paid to the holder is as follows:

(Floor rate - Current market rate) x principal x (# days to maturity/360)

-----End of Section-----

Derivatives - Question Bank

1. X Ltd wants to borrow floating rate funds for 5 years. It can do so at a spread of 250 basis points over LIBOR. It considers the interest rate to be too high. Instead it may borrow fixed rate funds at 11%. However it does not want to borrow fixed. When it approached its bank for advice, the bank quoted fixed v/s libor swap at 30/ 130 basis points over 5 year treasuries v/s libor. Five year treasuries are presently yielding 9%.
- Explain how X Ltd. can use a swap to achieve floating rate funding at a cheaper cost?
 - If Libor at the beginning of each year in the 5 year period to be 8%, 10%, 7%, 9% and 8%. Find out the average annual cost of funds.

2. X Ltd. has already borrowed funds at a fixed rate for 7 years @ 14% 2 years ago. It is now expecting interest rates to fall. To capitalise on the same, it decides to convert its fixed rate liability into floating rate liabilities through a swap. Banks are quoting fixed to floating interest rate swap at 40/ 70 basis points over 5 year treasuries v/ s Libor. Explain how x Ltd can accomplish its objective. Compute its annual interest rate if Libor in the five year period happens to be 9%, 10.55, 11%, 12% and 10%. On a post facto basis, do you think it was prudent for X Ltd. to have converted the nature of funding? Treasuries are yielding 9%.

3. X Ltd wants to borrow fixed rate funds for five years. It can do so at interest rate of 13% p.a. Also floating rate funds are available at spread of 150 basis points over LIBOR. It approaches swap bank which quotes 5 year fixed to floating swap at 20/ 30 basis points over 5 years treasuries v/ s LIBOR. How should the firm reduce cost of its fixed rate funding? Given that 5 years treasuries are yielding 10%.

Another firm Y Ltd borrowed 7 year fixed rate funds 2 years ago at 14%. Now it is expecting interest rates to fall and therefore wants to convert its fixed rate liability into floating rate liability. Explain how y Ltd. can achieve this objective? What would be the position of swap bank?

Suppose LIBOR in the 5 year period happens to be 9%, 10%, 11%, 12% and 13%. Find out the average cost of fund for Y and state whether Y benefitted as a result of a swap.

4. Two firms A & B wish to procure funds from the market. The rate of interest applicable to their borrowings as well as their desired form of funding is shown in the table below.

	Fixed	Floating	Preference
A	10	L + 1	Floating
B	13	L + 2	Fixed

Design a swap such that both the firms are able to achieve their preferred form of funding at a cheaper rate.

Note: Suppose A & B do not know each other. Instead, they are both customers to a bank. Design a swap with the bank acting as an intermediary such that the overall swap gain is distributed between A, B and the bank in the ratio 1: 1: 2.

5. Companies A and B face the following interest rates:

	A	B
U.S. Dollars (floating rate)	Libor + 0.5%	Libor + 1.0%
Canadian (fixed rate)	5.0%	6.5%

Assume that A wants to borrow U.S. dollars at a floating rate of interest and B wants to borrow Canadian Dollars at a fixed rate of interest. A financial institution is planning to arrange a swap and requires a 50 basis point spread. If the swap is equally attractive to A and B what rates of interest will A and B end up paying.

6. Suppose a dealer quotes All in Cost for a generic swap at 8% against six month LIBOR flat. If the notional principal amount of swap is Rs 500000.
 - a. Calculate semi- annual fixed payment.
 - b. Find the first floating rate for (i) above if six month period from the effective date of swap to the settlement date comprises 181 days and that the corresponding LIBOR was 6% on the effective date of swap.
 - c. In (ii) above, if the settlement is on Net basis, how much the fixed rate payer would pay to the floating rate payer.

Generic swap is based on 30/ 360 basis.

7. Astoria Inc. had raised floating rate funds two years ago at 6-month Prime + 1.25%. Now it wants to Convert this liability into fixed rate funding for 3 years. It approaches Bank of New York for a swap. Bank of New York is quoting 6-month Prime/Fixed rate swap at 80/100 basis points over 5-year US treasuries which are yielding 4.55%. The Bank agrees to do the swap with Astoria. Bank of London is launching a Eurobond issue at a fixed dollar cost of 5.25%. The bank prefers a 6-month LIBOR based funding. Bank of New York is quoting 6-month LIBOR/Fixed rate swap at 100/125 basis points over 5 year US treasuries. The Bank of London entered into a fixed-to-floating rate swap with Bank of New York. Bank of Riverside has Prime based assets funded with LIBOR based deposits. It wants to remove the mismatch of its assets and liabilities. It is willing to pay 6 month Prime + 0.25% in return for 6 month LIBOR.

You are **required** to:

- a) Calculate the fixed rate achieved by Astoria by entering into the swap.
 - b) Mention what are the risks taken up by the Bank of New York by entering into swap with Astoria?
 - c) Calculate the floating rate cost achieved by the Bank of London.
 - d) Show the assets and liabilities position of Bank of New York after entering into swap with Astoria and Bank of London. Does the swap with Bank of Riverside helps the Bank of New York?
 - e) Find out the net gain of Bank of New York after all the three swaps. Show all the swaps entered by the Bank of New York after all the three swaps. Show all the three swaps with the help of diagram.
8. The stock of RIL are presently trading at 1950 6 month future are traded. Risk free interest rate is 8% p.a. Annualised dividend yield is 5%.
 - a. Find out the theoretical futures price
 - b. Show the process of arbitrage if futures are present trading at 2000.
 - c. Show the process of arbitrage if futures are presently trading at 1955.
 9. The mean and SD of the daily absolute change in the value of Nifty future contracts happens to be 8000 and 4000 respectively. What should be the initial and maintenance margin?
 10. On 1st of January a trader bullish on the stock of SBI went long on 8 Futures contract, when the share was trading at 1200. The futures expire at the end of March. On 1st of February the trader squared off 5 contracts at the future price of 1410. The remaining contracts are not squared off till maturity and share price on maturity happens to be 5% lower than the share price on 1st of February.

- b. How can the information available in (a) above be used by an arbitrageur? Calculate the arbitrageur's gain/losses if the index is at 3400 or at 3800 at the end of six months?
- c. As a stock index arbitrageur what are the risks you should be cautious about?

15. The price of Silver was \$ 7.511 per ounce in the New York market on April 27, 2001. At the close of trading on the same day, the settlement price of December 2001, silver futures contracts was \$8.456. The annualized borrowing rate on April 27, 2001 was about 11% on the Euro dollar rates. The cost of storing silver is negligible, as the quantity stored is very small.

You are required to calculate the following:

- a. The Cost of Carry relationship between the cash price of silver and the futures price of silver?
- b. Show how an arbitrage gain can be made with the conclusion derived by you in (a) above.

16. A fund manager manages a corpus of Rs 200 crores comprised of-

Equity - 120 crores with $\beta = 3.8$

Bonds- 60 crores with $\beta = 0.6$

Cash and cash equivalent - 20 crores with $\beta = 0$

He is afraid of market falling

- 1) Explain how can we use stock index futures for portfolio performance
- 2) How many futures contracts should be bought or sold to achieve a target β of 0.5

It is given that nifty futures trade at 4600 with a multiple of 50.

- 3) How many nifty futures contracts should be bought/ sold for complete hedging
- 4) How many reliance futures should be bought/ sold for complete hedge given that reliance futures trade at 1990 with a multiple of 200. Also β of reliance = 1.8

17. Consider a fund manager managing a corpus of 250 crore comprised as follows:

Equity = 150 crore with a beta of 3

Debt = 80 crore with a beta of 0.8

Cash and cash equivalents = 20 crore and beta = 0

Nifty futures trade at a multiple of 50.

- a. How many Nifty Future Contracts should be bought or sold for complete hedging. Prove the same.
- b. How many Nifty future contracts should be bought / sold to achieve a target beta of 0.5. Prove the same.

18. A portfolio manager owns 3 stocks:

Stock	Shares owned	Stock Price (Rs)	beta
1	1 lakh	400	1.1
2	2 lakhs	300	1.2
3	3 lakhs	100	1.3

The nifty index is at 1350 and futures price is 1352 to use stock index futures to,

(a) Decrease the portfolio beta to 0.8 and

(b) Increase the portfolio beta to 1.5.

Assume the index factor is Rs 100. Find out the number of contracts to be bought or sold of stock index futures.

19. A sold one January Nifty futures contract for Rs 3, 40,000 on January 15, for this he had paid an initial margin of Rs 34000 to his broker. Each nifty futures contract is for the delivery of 200 Nifties. On January 25, the index was closed on 1850. How much profit/ loss A has made?
20. On 17/ 01, a US firm knows that it has a £ 890000 receivable on 17/ 03. The spot rate is £ 0.6452/ \$ and the 2 month forward rate is £ 0.6495/ \$. Pound futures for maturity ending March are quoted at \$ 1.5367/ £. Standard size of the contract is £ 62500. On 17/ 03, the spot rate happens to be £ 0.6508/ \$ and pound futures quote at 1.5329/ £. Compare no cover, forward cover and futures cover in terms of \$ inflows on 17/ 03?
21. On 10/ 05, an Indian firm has a £ 850000 payable on 10/ 09. The spot rate is Rs 86.52/ £ and the four month forward rate is Rs 87.10/ £. Rupee futures of maturity in September end are trading at £ 0.0015/ Re. One contract is for Rs 300000 and the initial margin requirement is Rs 8000/ contract. Opportunity cost = 10% p.a. On 10/ 09, spot rate is Rs 87.48/ £ and the Rupee futures quote at £ 0.0109/ Re. Compare no cover, forward cover and futures cover in terms of Rupee outflow on 10/ 09?
22. On 10/ 07, an Indian firm knows that it has a \$ 590000 payable on the 10/ 09. The spot rate is Rs 47.64/ \$ and the 2 month forward rate is Rs 47.85/ \$. Dollar futures of maturity on the same date are trading at Rs 47.89/ \$ (contract size is \$ 100000). On the 10/ 09, the spot rate happens to be Rs 47.95/ \$ and the futures quote at Rs 48.07/ \$. Compare no cover, forward cover and futures cover with respect to Rupee outflow on the 10/ 09?
23. On 10/ 01, an Indian firm has a \$ 740000 receivable on 10/04. The spot rate is Rs 46.27/ \$ and the 3 month forward rate is Rs 46.40/ \$. Rupee futures maturing in April end are trading at \$ 0.0195/ Re. Standard size of one contract is Rs 250000 and the initial margin requirement is Rs 10000/ contract?
On 10/ 04, the spot rate happens to be Rs 46.10/ \$ and the Rupee futures quote at \$ 0.0202/ Re. Consider opportunity cost of funds to 10% p.a. Compare No cover, forward cover and futures cover in terms of rupee inflow on 10/ 04?
24. ABC Technologies is expecting to receive a sum of US \$ 400000 after 3 months. The company decided to go for future contract to hedge against the risk. The standard size of future contract available in the market is \$ 1000. As on date spot and futures \$ contract are quoting at Rs 44.00 and Rs 45.00 respectively. Suppose after 3 months the company closes out its position futures are quoting at Rs. 44.50 and spot rate is also quoting at Rs 44.50. You are required to calculate effective realization for the company while selling the receivable. Also calculate how company has been benefitted by using the future option.
25. A Unit Trust wants to hedge its portfolios of shares worth Rs 5 million using the BSE- SENSEX index futures. The contract size is 100 times the index. The index is currently quoted at 6840. The beta of the portfolio is 0.8. The beta of the index may be taken as 1. What is the number of contracts to be traded?

26. Consider the following quotations on 1st Jan 2008.

Particulars	Rs/ \$	Rs/ £
Spot rate	41.65	94.50

1 month futures	42.20	93.20
2 month futures	42.90	92.10

- i. A speculator is bearish on the movement of Rs against pound and wants to speculate using 2 month Rs/ £ futures. What do you advice?
On the 1st of February, the one month Pound futures quote at 92.75. Find out the overall profit or loss (lot size £ 100000).
- ii. A speculator has no directional view on the movement of Rs/ \$ rate. However he strongly believes that the gap between the one month and two month dollars future is on the lower side. What strategies do you advice?
On 15th Jan, the 15 day and 45 day dollar futures quote at Rs 41.60/ \$ and 42.50/ \$. Find out the overall profit or loss. (Lot size \$ 100000).
- iii. Compute the synthetic \$ / £ rate and comment on the markets 'consensus view of the movement of pound against dollar. The speculator is a contrarian and thinks otherwise. What do you advice?
On the 1st of Feb. the one month \$ and £ futures quote at 43.20 and 93.40 respectively. Find out the overall profit or loss.

27. Consider a 2 month call option on the stock of Tata Motors at a strike price of 800 trading at a premium of Rs 25. Show the profit diagram and profit profile for the call holder and call writer.

28. Consider a 3 month put option on the stock of HUL at a strike price of 200 trading at a premium of Rs 10. Show the profit diagram and the profit profile for the put holder and put writer.

29. An Indian firm has \$ 2 lakhs payable 3 month from now. The spot rate is presently Rs 43.05/ \$. The three month forward rate is Rs 43.60/ \$. The following three month European options are traded.

Options	Strike price/ exercise price	Premium
Put	42.50	0.50 paisa
Call	43.50	0.40 paisa

The treasury department has the following forecast to share with you.

Spot rate after 3 month	probability
41.50	.2
43.0	.4
44.5	.1
46	.3

Evaluate No cover, Forward cover, Call cover, put cover, and Range forward.

30. A Japanese firm has £ 40000 receivable 6 months from now. The spot rate is Yen 220/ £ and the six month forward rate is Yen 212/ £. Six month interest rate-

Yen	£
1.2%/ 1.25%	4%/ 4.4%

The following option quotes are available:

Option	Strike price	Premium
Put	210	14 Yen
Call	225	10 yen

Evaluate the following strategies-

- a. No cover

- b. Forward Cover
- c. Call cover
- d. Put Cover
- e. Range Forward
- f. Money Market Hedge

The forecast of the spot rate 6 months from now-

Spot	Probability
202	.25
215	.15
230	.40
250	.20

31. XYZ Ltd. a US firm needs £ 300000 in 180 days. In this connection, the following is available:

Spot rate 1 £ = \$ 2.00

180 day forward rate of £ as of today = \$ 1.96

Interest rate is as follows:

	UK	US
180 days deposit rate	4.5%	5%
180 day borrowing rate	5%	5.5%

A call option of £ that expires in 180 days has an exercise price of \$ 1.97 and a premium of \$ 0.04.

XYZ Ltd has forecast the spot rates 180 days hence as below:

Future Rate	probability
\$ 1.91	25%
\$ 1.95	60%
\$ 2.05	15%

Which of the following strategies would be most preferable to XYZ Ltd?

- a) Forward contract
- b) Money market hedge
- c) Option contract
- d) No hedging

32. An investor buys a share at 500 and buys a put option on the share at E = 480. Premium = 5. Evaluate the strategy.

33. An investor buys a share at 500 and sells a Call at E = 525. Premium = 6. Evaluate the strategy.

34. The following Call and Put options of maturity September end are available on PNB,

Strike Price	Put premium	Call Premium
470	10	25
500	15	18
530	22	12

Evaluate -

- 1. Long straddle
- 2. Long strip
- 3. Long Strap
- 4. Long strangle

35. Consider the following September end and option quotation on Nifty

Strike Price	Put Premium	Call premium
4000	80	280
4200	130	140
4400	250	100

Design –

- Volatile Butterfly Spread
- Non Volatile Butterfly spread.

36. An investor holds the shares of two companies A and B. He bought the shares of A at Rs 200 and the shares of B at Rs 250. He wrote a 3 month call option on the shares of A and bought a 3 month put Option on the share of B at exercise price of Rs 230 and Rs 210 respectively. The premium on the call option was Rs 10 and that of Put option was Rs 5. On the day of expiration, the share prices are expected to be in the following range:

Price of A	Price of B
180	235
160	210
150	195
175	180
195	215
215	240
240	265

You are required to calculate the profit/ loss in the above range of prices for the ,

- Covered call and
- Protective Put

37. Consider the following quotations for September end Options on ICICI bank.

Strike Price	Put Premium	Call premium
600	35	50
650	65	22

Design –

- Bull call spread
- Bear call spread
- Bull Put spread
- Bear Put spread

38. Consider the following options on a stock.

Option	Strike Price	maturity	premium
Call	500	6 month	60
Put	500	6 month	65

The share is presently trading at 495 and Risk free interest rate is 6% p.a. Spot mispricing and advice **arbitrage**.

39. Consider a one year Call option on a stock at Strike price of 480. The stock presently trades at 500. At the end of the year the stock price can go up by 20% or come down by 10%. Risk free interest rate is 6% p.a.

Find out the price **of the call using Risk Neutralisation method**.

40. Find out the price of a 3 month call and put option on a stock at $E = 1200$. The share also trades at 1200 and in 3 months time, the share price can become 1320 or 1140. Risk free rate is 8% p.a. use **Binomial model**.
41. Find out the value of 6 month American Call and put option on a stock at a strike price of 995. The stock presently trades at 1000. In each of the three month period, the stock can go up and down by 10%. Risk free rate of interest = 6% pa. Use **two period binomial model**.
42. Find out the value of 6 month Put option on stock at $E = 510$. The stock trades at 500 with the annualised volatility of 40%. Risk free rate = 6% p.a. continuous. Given ,
($e^{.003} = 1.0031$; $\ln (.9804) = -0.0198$). Use BSM.
43. A firm plans to borrow \$ 5 million for 3 months, 6 months from now. The current 3 month Libor is quoting at 5.50 – 5.75%. The firm has to pay a spread of 25 bps over libor. The treasurer is apprehensive about the possibility of rates rising over six months. He wishes to lock in the cost of the loan. Dollar 6/ 9 FRA is being offered at 5.8750%. The treasurer decides to buy it. Work out the firm's cost of borrowing under both alternatives.
- Scenario 1 – LIBOR after 6 months = 6.5%
 - Scenario 2 – LIBOR after 6 months = 5.25%
44. A fund manager is expecting to have \$5 million 3 months from now to invest in a 3 month (92 days) Eurodollar Deposits. The current 3 month rates are 4.25- 4.375%. The \$ 3/ 6 FRA bid rate is 4.1250. The manager sells an FRA with notional principal \$5 million. Work out the rate of return for the fund manager under both alternatives.
- Scenario 1 – LIBOR after 3 months = 3.50%
 - Scenario 2 – LIBOR after 3 months = 5.20%
45. An American Company has decided to raise a 5-year floating rate loan of \$100 million. The loan is indexed to 6 month LIBOR with a spread of 40 basis points. The current level of 6-month LIBOR is 3.20%. A 5-year interest rate cap on face value \$100 million with strike price 3.50% is quoted in the market at a premium of 1.5%, which the company thinks is very high. It also identified a 5-year interest rate floor on face value \$100 million with strike price 3% is available for a premium of 1%.
- You are required to state how the company can hedge its interest rate exposure through those interest rate **cap and floor**. Also calculate the effective cost of the loan showing all the relevant cash flows if the 6 months LIBOR for the next 9 rollover dates turned out as: 3.05%, 2.90%, 2.78%, 2.96%, 3.35%, 3.60%, 3.70%, 3.90%, and 4.10%.
- (You can assume a discount rate of 3.50% for amortizing the premium.)
46. A treasurer of a multinational company has invested \$ 10 million in a 5- year FRN which pays a semi - annual interest of 0.25% over 6 month Libor. The 6 month Libor for the first semester is fixed at 3.25%. Treasurer believes that the Federal Reserve will reduce the dollar interest rate in the future. To hedge the interest rate risk, the treasurer has also purchased a 5 year **floor** on 6 month Libor at a strike price of 3% by paying premium of 2% on the face value of \$ 10 million.
- You are required to compute the effective rate of return on the investment showing all the cash flows if the 6 months Libor at the next 9 reset days turns out to be 3.08%, 2.90%, 2.75%, 2.60%,

2.50%, 2.45%, 2.80% 3.05%, 3.15% respectively. (Use a discount rate of 3% to amortize the premium.)

47. Mr X established the following spread on the Delta Corporation's stock:

- i. Purchased one 3- month call option with a premium of Rs 30 and an exercise price of Rs 550.
- ii. Purchased one 3- month Put option with a premium of Rs 5 and an exercise price of Rs 450.

Delta Corporation's stock is currently selling at Rs 500. Determine profit or loss, if the price of Delta corporation's:

- a. Remains at Rs 500 after 3 months.
- b. Falls at Rs 350 after 3 months
- c. Rises to Rs 600
- d. Assume the size of option is 100 shares of Delta Corporation.

48. The market received rumour about XYZ Company's tie up with a multinational company. This has induced the market price to move up. If the rumour is false, the XYZ Company stock price will probably fall dramatically. To protect from this an investor has bought the call and put options.

He purchased one 3 months call with a strike price of Rs 52 for Rs 2 premium, and paid Re 1 per share premium for a 3 month put with a strike price of Rs 50.

- i. Determine the investor's position if the tie up offer bids the price of stock up to Rs 53 in 3 months.
- ii. Determine the investor's ending position, if the tie up programme fails and the price of the stocks falls to Rs 46 in 3 months.

49. The six month forward price of a security is Rs 200. The borrowing rate is 8% per anum payable with monthly rests. What should be the spot price?

50. You are trying to value a long term call option on the standard and Poor's 500, expiring in 2 months, with a strike price of \$900. The index is currently at \$930, and the annualised standard deviation in stock prices is 20% per anum. The average dividend yield on the index is 0.3% per month, and is expected to remain unchanged over the next month. The Treasury bond rate is 8%.

- a. Estimate the value of the long term call option.
- b. Estimate the value of a put option, with the same parameters.
- c. What are the implicit assumptions you are making when you use the Black- Scholes model to value this option?

Which of these assumptions are likely to be violated? What are the consequences for your valuation?

51. The following table provides the prices of options on equity shares of X Ltd. And Y Ltd. The risk free interest is 9%. You as a financial Planner are required to spot any mispricing in the quotations of option premium and stock prices? Suppose, if you find any such mispricing then how you can take advantage of this pricing position.

Share	Time to exercise	Exercise Price (Rs)	Share price	Call price	Put price
X Ltd	6 months	100	160	56	4
Y Ltd	3 months	80	100	26	2

52. The following details are related to the borrowing requirements of two companies ABC Ltd. And DEF Ltd.

Company	Requirement	Fixed Rates Offered	Floating Rates Offered
ABC Ltd	Fixed Rupee Rate	4.5%	PLR + 2%
DEF Ltd	Floating Rupee Rate	5.0%	PLR + 3%

Both the companies are in need of Rs 25000000 for a period of 5 years. The interest rates on the floating rate loans are reset annually. The current PLR for various period maturities are as follows:

Maturity (years)	PLR (%)
1	2.75
2	3.00
3	3.20
4	3.30
5	3.375

DEF Ltd. has bought an interest rate Cap at 5.625% at an upfront premium payment of 0.25%.

- You are required to exhibit how these two companies can reduce their borrowing cost by adopting swap assuming that gains resulting from swap shall be shared equity among them
- Further calculate cost of funding to these two companies assuming that expectation theory holds good for the 4 years.

53. XYZ Plc borrows £ 20 million of 6 months LIBOR + 0.25% for a period of two years. Mr. Toby, Treasury Manager of XYZ anticipates a rise in LIBOR, hence proposed to buy a Cap option from a ABC bank at strike rate of 7%. The lump sum premium is 1% for the whole of the three resets period and the fixed rate of interest is 6% p.a. The actual position of LIBOR during the forth coming reset period is as follows:

Reset Period	LIBOR
1	8.00%
2	8.50%
3	9.00%

You are required to show how far interest rate risk is hedged through Cap Option.

54. X Ltd's share is currently trading at Rs 220. It is expected that in six months time it could double or halved (equivalent to a $\sigma = 98\%$). One year call option on X Ltd's share has an exercise price of Rs 165. Assuming risk free rate of interest to be 20%, calculate

- Value of call option on X Ltd's share.
- Option Delta for the second six month, in case stock price rises to Rs 440 or falls to Rs 110.
- Now suppose in 6 months the share price is Rs 110. How at this point we can replicate portfolio of call options and risk free lending.

55. The October pepper future trades at 17.50, the October 18.00 call at 0.45 and the October Put at 0.58. Both are options on October future. Find out whether any arbitrage opportunity exists.

56. A Put and Call option each have an expiration date 6 months hence and an exercise price of Rs. 10. The interest rate for the 6 month period is 3%.

- a) If the put has a market price of Rs 2 and share is worth Rs 9/ share, what is the value of the call?
- b) If the Put has a market price of Rs 1 and the calls Rs 4, what is the value of the share per share?
- c) If the Calls has a market value of Rs 5 and the market price of the share is Rs 12/ share, what is the value of the Put?
57. You are given three Call options on a stock at exercise price of Rs 30, Rs 35 and Rs 40 with expiration date in three months and the premium of Rs 4, Rs 2 and Re 1 respectively. Show how the option can be used to create a butterfly spread. Construct a table with different market prices and show how profit changes with stock prices ranging from Rs 20 to 50 for the butterfly spread.
58. The current price of a stock is Rs.300 and the volatility of the continuously compounded annual returns from the stock is 15%. The continuously compounded risk free annual rate of interest is 8%. Three month put options on the stock at an exercise price of Rs.310 are trading at a premium of Rs.5. Are the put options fairly priced? Given $\ln(300/310) = -0.033$
59. A 6 month European put option n a non-dividend paying stock is traded at a strike price of Rs.70 whereas the prevailing stock price is Rs.73. The continuously risk free annual interest rate is 9.5%. The standard deviation of the continuously compounded rate of return on the stock is 25%. You are required to
- Determine the price of the European put option? Given that $\ln(73/70) = 0.042$
 - Enumerate the assumptions underlying the model used in (a) above?

-----End of Section-----

FOREIGN EXCHANGE

Financial management of a company is a complex process and it is made even more complex because of the globalisation taking place, which is making the world financial and commodity markets more and more integrated. The integration is both across countries as well as markets. Not only the markets, but even the companies are becoming international in their operations and approach. This changing scenario makes it imperative for a student of finance to study international finance.

In a globalised environment, the importance of international finance can never be overemphasized. All companies are affected by changes in interest rates –

- 1) Consider firms, who are having foreign exchange operations, say exporters and importers- Exporter is benefitted by home currency depreciation, while importer is benefitted by home currency appreciation. Similarly, if firm invests abroad, and is expecting foreign currency receivable later on, it would wish the home currency to depreciate. Borrowers, on the other hand, would want home currency to appreciate.
- 2) Consider a purely domestic Indian company, which sells products in India, but these products are also sold by competitors, who import the same. If Re. appreciates, the cost of import decreases. The importers may, therefore, reduce the price of a product in India. The Indian company, may in that situation loose either in terms of market share or profit margin.
- 3) Consider a purely domestic Indian company, which does not face any foreign competition. It will still be affected by foreign exchange changes. This is due to the fact the foreign exchange market, money market, commodity market, etc. are integrated. Thus, a change in exchange rate may bring about a change in interest rate and inflation, which will affect even the purely domestic company.

The Foreign Exchange Market is an over the counter market where foreign currencies are bought and sold against one other: The term “Over the Counter” implies the lack of a physical place. RBI regulates the market and like all regulators, it would want the market to be liquid, deep and efficient. In order to achieve tis objective, RBI has appointed Banks to act as market makers. They are called authorized dealers (AD’s).

Exchange Rate Quotations

Exchange Rate may be defined as the price of one currency in terms of another. There are two types of exchange rate quotations –

- **Direct Quote** i.e. number of units of home currency per units of foreign currency. For example: 1\$ = Rs.46.50; 1£ = Rs.72.50, etc.
- **Indirect Quote** i.e. Number of units of foreign currency per unit of home currency. For example: Pte/Rs. = 0.0357(Pte stands for Spanish Peseta); CHF/Rs. = 0.0157 (CHF stands for Swiss franc); DM/Rs. = 0.0168 (DM stands for Deutche Marks)

RBI requires AD’s to furnish direct quotes.

Market Making

RBI has appointed banks as authorised dealers, and therefore banks act as market makers. Market maker is a person who quotes two prices for a commodity – BID Rate and ASK Rate. Examples:

➤ Bank A quote- Rs/Yen 100= 2.1450/2.1560

The above quote implies that Bank A is bidding for Yen 100 at Rs.2.1450 and is asking Rs.2.1560 to sell Yen 100. From customers point of view the rate for buying 100 Yen is Rs.2.1560 and the rate for selling 100 Yen is Rs.2.1450.

Bid – Ask Spread

The bid ask spread is meant for covering the

- Covering the expenses of the bank in the dealing business
- Risk Premium
- Normal Profit

Bid ask spread is a function of three factors

- Exchange rate volatility (positive function)
- Competition between market makers (negative function)
- Volume or turnover (negative function)

Two Way Arbitrage

Arbitrage may be defined as any activity that will generate profit without any investment and without any risk. Two way arbitrage in the forex market involves buying one currency say dollar from a bank and instantly selling it to some other bank resulting in profits.

The rates quoted by different banks between the same currencies are not identical, however the rate quoted by them overlap in such a manner that there is no scope for arbitrage.

Three Way arbitrage

Three- way arbitrage involves three currencies say X, Y Z and three banks say A, B, & C. The steps involved are:

- Step 1- Convert currency X into Y through Bank A
- Step 2- Convert Y into Z through Bank B
- Step 3- Covert Z into X through bank C

If we end up having greater amount of X in step 3, than we started with in step 1, there is a scope for three way arbitrage.

Cross Rates & Three way Arbitrage

In the Forex market it is a practice to quote most of the currencies against the dollar, and to calculate the exchange rates between other currencies with dollar as the intermediate currency. For example, the DM/£ rate will be calculated through the Dm/ \$ and the \$/ £ quote. The DM/ £ rate thus calculated is called a **cross rate or the synthetic rate**.

Spot Rates and Forward Rate

Spot rate is the rate applicable for delivery, two business days ahead. Thus if a firm buys \$100000 spot on Monday, the 23rd @ Rs40/ \$, the firm will pay Rs40 lacs and receive \$100000 on Wednesday, the 25th.

Forward rate is the rate fixed in a forward contract. A forward contract in the currency market refers to a contract to buy/sell a certain amount of a foreign currency at a predetermined rate i.e. forward rate, on a predetermined date (maturity date). Forward rates are used extensively by exporters & importers to hedge their foreign currency payable or receivable.

Forward rates are generally used by importers and exporters to hedge against foreign exchange risk. Risk refers to uncertainty. For instance, an Indian importer has \$100000 payable after two months. So, he is afraid of dollar appreciating against rupee.

Forward Premium & Discount on a Currency

Both spot rates and forward rates are determined by demand & supply forces. If the forward rate (F) is higher/ lower than the spot rate (S), the denominator currency is said to be at a forward premium/ discount.

Annualised forward premium = $\frac{F-S}{S} \times 100 \times \frac{12}{n}$ where,

F= forward rate, S= spot rate, n= maturity.

A negative answer would imply discount.

Note: On account of the base effect, discount is slightly less than the premium.

Swap Points

Generally forward rates are not given to us. Instead spot rate and swap points are given. Swap points are a difference between the spot rate and forward rate (generally representing the very last decimal places depending on the quote).

If the swap points are low/ high, they are to be added and if they are high/ low, they are to be deducted.

Option Forward Contract

This is a special type of forward contract where the customers enjoy the option to take or make delivery of the foreign currency at any time during and certain period in future. The bank will give an unfavourable quote.

Retail Market

Based on the parties to the transaction, foreign exchange transactions can be categorized into three types:

1. Between the RBI and the Dealers.
2. Inter Bank market i.e. Wholesale Market (Bank to Bank).
3. Retail Market (customer and corporate with bank).

The rates quoted in the retail market are known as the Merchant or Telegraphic transfer (TT rates). These are based against the retail consumer and are computed with the help of TT buying and selling commission.

For example: Bank A quoted in the interbank market-

Rs/ \$ = 45.40/ 90

T.T. buying commission = .12%

T.T. selling commission = .1%

T.T buying rate refers to the rate at which bank buy from a retail customer = Interbank Bid rate- TT buying commission = $45.4 - (0.12\% \text{ of } 45.4) = 45.35$

Currency of Borrowing & Investment

If a company borrows in its home currency, the home currency interest rate is what matters. If it borrows foreign currency, it will have foreign currency payable. If it decides to hedge the same through forward contract, the forward premium or discount on the foreign currency with respect to the home currency along with the foreign currency interest rate would come into play. It would obviously choose the currency of borrowing which would result in the lowest home currency outflow on maturity on a covered basis.

Similarly in case of investing, it would choose the currency of investment which would result in the highest home currency inflow on, maturity on a covered basis.

Exchange Rate Determination

Exchange rates are determined by demand and supply forces. These forces are shaped by a number of forces-

- Inflation rates
- Interest rates
- Fiscal Deficit
- Monetary Policy etc.

It is next to impossible to determine with certainty the collective influence of all these factors on exchange rates. In this topic we study the relationship between-

- 1) Exchange rates and Interest Rates (IRP)
- 2) Exchange rates and Inflation (PPP)

Interest Rate Parity (IRP)

IRP establishes a relationship between exchange rate and interest rates. If interest rates on currency B is greater than A, currency B should be at a forward premium. i.e.

If, $IB < IA$, then

$F(A/B) > S(A/B)$

To be more specific, the annualised forward premium on currency B should approximately be equal to the interest rate differential.

$$\text{i.e. } \frac{F(A/B) - S(A/B)}{S(A/B)} = \frac{i_A - i_B}{1 + i_B}$$

Thus, if Re and \$ interest rates are 10% p.a. and 4% p.a. respectively-

- i. \$ should be at a forward premium of approximately 6% and exactly by $6/1/1.04 = 5.77\%$
- ii. Re should be at forward discount of approximately 6% and exactly by $6/1.1 = 5.45\%$

The above formulas assume that we have one year forward rates.

The fact of matter is that RBI guidelines do not permit forward quotations beyond 6 months. So, in the context of forward rates for more than 1 year, IRP is given by-

$$\frac{F}{S} = \frac{1 + ni_A}{1 + ni_B}$$

Example:

Given Spot (Rs./\$) = Rs.47.5

6 month Re. interest rate = 9% p.a.

6 month \$ interest rate = 5% p.a.

Solution: 6 Month forward rate can be calculated as follows:

$$\frac{F}{S} = \frac{1 + ni_A}{1 + ni_B}$$

$$\frac{F}{47.5} = \frac{1 + (0.5 \times 0.09)}{1 + (0.5 \times 0.05)}$$

$$F = \frac{47.5 \times 1.045}{1.025} = \text{Rs.48.43}$$

Purchasing Power Parity (PPP)

The Value of money may be defined as the amount of goods and services which money can command. Due to inflation, the value of money falls. So, if US has a lower inflation than India, there would be a lower decline in the purchasing power of dollar as compared to Rupee. So, dollar should appreciate against rupee. More specifically if the inflation rates in US and India are 2% and 5% respectively- Dollar should appreciate approximately by 3% and exactly by $3/1.02 = 2.94\%$.

Rupee should depreciate against dollar approximately by 3% and exactly by $3/1.05 = 2.85\%$.

PPP is based on the law of one price i.e. the price of a commodity throughout the world should be same when expressed in terms of common currency. This is required to ensure that there is no commodity arbitrage (assuming that there are no transportation costs and trade barriers).

Let us imagine a common basket of commodities which is priced at \$10 in US and Rs500 in India. So, we have:

\$10 = Rs. 50

Therefore, \$1 = Rs. 500/10
= Rs. 50/\$

Now there is inflation of 2% in US and 5% in India. So, we have-

\$10.2 = Rs. 525

\$1 = Rs.51.40

This exchange rate that should prevail as per PPP is known as the **Real Effective Exchange Rate (REER)**. This can be computed with the help of formula given by-

$$\frac{S1(A/B)}{S(A/B)} = \frac{1+niA}{1+niB}$$

Where, n= number of years

Forward Cover Vs Money Market Cover

Earlier we had discussed that the only method of hedging was by means of entering into a forward contract. However, the discussion on IRP has established a certain relationship between spot rates, forward rates, and interest rates. Owing to this relationship, the forward rate might be undervalued/ overvalued. So, we now propose our alternative method of hedging – Money Market Cover (Class Notes).

Roll Over Forward Contracts

In India the maximum maturity of a contract is 6 months. However, a company may be having a foreign currency receivable or payable maturing beyond 6 months. To hedge such exposure there is a technique called roll over forward cover. This involves covering the exposure through a 6 month forward contract as if the exposure matures in 6 months. At the end of 6 months the forward contract is honoured by a spot transaction & a fresh 6 month forward contract is entered. This process is continued till the maturity date. In his manner the company is covered throughout the tenure of the payable or receivable. It is therefore protected from significant changes in exchange rate. However due to continuous buying & selling it results in significant transaction cost. So roll over strategy would turn out to be profitable only if there is a significant adverse movement in exchange a rate.

Types of Foreign Exchange

Exposure & Risk – There are 3 types of foreign exchange exposures: -

1. Transaction Exposure
2. Operating or Economic Exposure
3. Translation or Accounting Exposure

Transaction Exposure – It deals with a firm having a known foreign currency payable or receivable, the foreign currency equivalent of which is known with certainty but the home currency equivalent is uncertain. This exposure arises only when a firm enters into a foreign transaction by virtue of which it comes to have a foreign currency payable or receivable, the amount of which is known with certainty but the home currency equivalent of it is uncertain. So this exposure will arise only due to exports, imports, foreign borrowing and investments etc. A purely domestic firm will not face this exposure.

The techniques designed to hedge this exposure may be broadly divided into two –

- ❖ Internal hedging techniques
- ❖ External hedging techniques

Methods of hedging transaction exposure [V.I. for theory]

Internal hedging techniques

The firm will hedge in the normal course of business

- a. Invoicing
- b. Leading & Lagging
- c. Outsourcing
- d. Netting

External Hedging techniques

The firm will hedge by entering into a separate contract

- a. Forward Cover
- b. Money Market Cover
- c. Futures Cover
- d. Options Cover

Internal Hedging Techniques: The firm tries to hedge the exposure in the normal course of business i.e. without entering into an external contract. These include –

Invoicing – Invoicing as an internal hedging technique involves drawing the invoice in home currency. Thus, if the terms of the trade permit, an Indian importer / exporter should have the invoice drawn in INR. Normally, invoice is drawn in the seller's currency. However, if the bargaining power of the buyer is high, it could be otherwise. Invoicing may be in a third currency or there may be a case of dual invoicing i.e. invoicing partly in the seller's currency & partly in the buyer's currency.

Leading & Lagging – This implies:

- Lead the payable in a strong currency
- Lag the payable in a weak currency
- Lead the receivable in the weak currency
- Lag the receivable in a strong currency

Outsourcing – It involves outsourcing the inputs and business process requirement from the country to which the firm is presently exporting. Thus, if an Indian company is exporting to US, it has \$ receivable and is therefore afraid of \$ depreciating. To hedge the same, it should start importing from US.

Netting – This implies setting off the payable and receivable in the same currency, thereby, reducing transaction cost. It is especially prominent in the case of multinational companies having subsidiaries all around the world.

Example: An Indian company has \$ 100,000 payable and \$ 30,000 receivable from a UK company. The following rates are quoted –

RS/£ = 74.60/10

\$/£ = 1.40/1.45

Calculate the benefit of netting for the Indian and UK Company

Example: An Indian company has a \$ 100,000 payable after 3 months. The US exporter is agreeable to grant a discount of \$ 3,000 in case of prompt payment. The following information is furnished –

Spot (Rs /\$) = 45.60/

3 month swap points = 10

The cost of short term funds for the Indian firm is 13% p.a. Advise the firm

External Hedging Techniques –

- Forward Cover
- Money Market Cover
- Futures
- Options
- Financial Swaps

Operating or Economic Exposure

This exposure is faced irrespective of whether a firm entered into a foreign transaction or not. Thus consider an Indian firm which uses all its inputs in India to produce the output which is sold only in India. Moreover, it does not borrow or invest abroad. Even such a firm may be exposed to exchange rate fluctuations.

For instance, the firm's competitors import the same product from US and sell it in India. If Rupee appreciates against Dollar, the importers gain. They may therefore reduce the price of their product. The Indian firm stand to suffer either in the form of lower marked share or lower market share or lower profit margins.

Exchange rate, interest rate and inflation are interlinked. So a change in exchange rate may bring about a change in interest rate and inflation which would affect even a purely domestic Indian firm.

Example: Suppose, there is sudden spurt in oil prices which increases Indian oil import bill significantly. The resultant demand for \$ tends to push up the rupee dollar exchange rate very steeply.

Though in India we have a floating exchange rate system i.e. Exchange rates are supposed to be determined by the free forces of demand and supply, yet in reality it is a managed float/dirty floats. So, RBI frequently intervenes in the Forex market to smoothen out steep changes in Exchange rate. In the present case RBI may sell \$ reserves to bring down the exchange rate.

Sale of \$ reserves implies corresponding buying of rupee from the market which will decrease the money supply.

A higher interest results in a higher cost of borrowing for the Indian company.

Moreover, a lower money supply implies a lower rate of inflation, which would affect the purely domestic company both on the cost side and revenue side. The ultimate impact of which is situation specific.

It need to be entertained that even a firm having a foreign currency payable or receivable whose amount is not known with certainty is subject to operating exposure.

Even if an Indian Exporter to US invoices in rupee, changes in exchange rate will bring about a change in the dollar equivalent price. Given the price elasticity, there will be a change in the demand for the product. For instance the exporter is invoicing at Rs.5000 per unit and the initial exchange rate is Rs.50/\$.

So the \$ equivalent price is $5000/50 = \$100/\text{unit}$

At this price there is a demand for 10,000 units. Now, suppose dollar appreciates to Rs.55/\$. Therefore, the dollar equivalent price = $5000/55 = \$90.91/\text{unit}$

So price has fallen by 9.09%

Suppose, the price elasticity of demand $e_p = -2$

Therefore, demand will go up by $= 9.09 \times 2 = 18.18\%$

So new quantity sold $= 10,000 \times 1.1818 = 11,818$

So the exporter is able to sell more.

Transaction or Accounting exposure

This exposure relates to the translation of the financial statements of foreign branches or subsidiaries into the parent company's home currency. This translation takes place at different rates and may result in some translation gain or loss. However, his loss or gain is not accompanied by any cash flow and is therefore purely notional. There is no need to manage this exposure. However investors may not be matured enough to understand notional feature of this loss or gain and may treat the same as real. This would affect share prices and in such a situation it becomes necessary to manage even this exposure.

SWAPS

Swap is an exchange of foreign currencies. There can be two types of Swap –

Buy – Sell Swap (Swap in) i.e. buy spot and sell forward.

Sell – Buy (Swap out) i.e. sell spot and buy forward.

The two parties, the two currencies and the amount of one currency must be the same in a swap transaction. The exchange rate for a swap transaction is normally better than normal transaction. These would either be given to us or are to be determined by the method explained below: -

Given, Spot (Rs/\$) = 45.50/45.90

3 Months swap points = 30/40

Thus, if Mr. X wants to enter into a \$ 100,000 buy-sell swap, He would buy \$100,000 spot Rs.45.9 per \$ and sell \$100,000, 3 month forward at Rs.45.9 + 0.3 i.e. 46.2/\$ (i.e. adjustment of swap points will be made with the spot rate fixed on the swap).

In the case of sell-buy swap, the customer will sell \$ 1, 00,000 at Rs. 45.5/\$ and buy it 3 months forward at 45.5 + 0.4 i.e. Rs. 45.9 / \$

Cancellation, Extension & Early delivery of a forward contract

In India, forward contract are allowed only for hedging purpose. Thus, we can buy/sell dollar forward only if we have an underlying dollar payable/receivable, say by virtue of an import/export. However, the import/export order in pursuance to which the forward contract was entered may get cancelled/extended or premature. In such cases, the underlying forward contract has to be cancelled/extended/early delivered. The procedure of settlement with a bank in such a case will be done in accordance with RBI regulation and the guidelines of the foreign exchange dealers association of India (FEDAI).

Cancellation: This implies entering into an opposite contract. The profit/loss to the customer will be credited/debited to his account. Also as per FEDAI guidelines, a flat cancellation fee of Rs.100 shall be charged.

Extension: This involves cancellation of the old forward contract and entering into a fresh forward contract for the extended maturity. A flat extension fee of Rs.100/- will be charged as per FEDAI guidelines.

Early Delivery:

Case I – Early delivery with cancellation

Case II – Early delivery without cancellation

In the 1st case, the old contract will be cancelled and a new spot contract will be entered for early delivery. The profit/loss on cancellation will be computed as usual. Early delivery fee Rs.100 as per FEDAI. In the 2nd case, the old contract is not cancelled. Instead, it is executed at the old contractual rate on the early delivery date. For such execution, the concerned bank enters into a buy-sell or a sell-buy swap. The swap gain/loss if any is transferred to /charged from the customer. Time value considerations are also involved. Thus, the bank charges/pays interest on the net outflow/inflow on the date of early delivery. A fixed early delivery fee of Rs.100 is levied as per FEDAI guidelines.

Foreign Direct Investments (FDI)

The foreign Investment is the acquisition of assets in another country by a foreign entity – be it government, an institution or an individual. A country, vest in foreign direct investment (FDI) for its growth, if its savings are insufficient for productive investment in comparison to the demand. In such cases, the FDI can be a vehicle for stimulating growth. The FDI is imperative to economic development of a country. Above all it brings in new technology and management concepts that pave the way to judiciously utilize the resources, thereby increasing the productivity and finally hold a chunk in the business globally. Institutionalisation is one of the biggest advantages of FDI. It enforces the discipline and stability at market place and market dynamics taken care of the rest. It prepares the country to play and improve its horizon in global perspective and helps it to come out of its shell.

The presence of FDI is of definite help to a country mainly because there will be a better access to information and better monitoring capabilities. Studies also reveal that corporate governance and performance of the stock markets are positively related and the nations and firms with feeble corporate governance practices experience a bigger fall down when struck by adverse shocks and their currencies are subject to higher fluctuations. The biggest service a corporate can provide to society is the profit it generates in accounting terms and wealth creation in general. The discipline of value creation through innovation could be a lesson that can be learnt from FDI. The FDI can insist and lead to corporate integrity, transparency in decision making and direct it in the best interests of the shareholders.

Major Initiatives taken by Government of India to attract FDI are as follows:

- FDI up to 100% permitted under the automatic route in the advertising sector. FDI under the automatic route up to 100% is available for film sector and will not be subject to conditions about debt equity ratio, minimum level of equity investment etc.
- FDI up to 100% allowed in tea sector, including tea plantations, permitted subject to compulsory disinvestments of 26% equity in favour of Indian partner within a period of five years and prior approval of the state government in case of any future land use change.
- Re-issuance of ADR/GDR permitted to the extent of ADRs / GDRs which have been redeemed into underlying shares and sold in the domestic market.
- FDI up to 100% permitted with prior approval of the government for development of integrated township, including housing, commercial premises, hotels, resorts, and regional level urban infrastructure facilities such as roads and bridges and mass rapid transit system.
- Automatic route in FDI up to 100% allowed in all manufacturing activities in special Economic zones, except some of the activities such as arms and ammunitions, explosives and allied items of defence equipment, defence aircrafts and warships, automatic substances, narcotics, distillation and brewing of alcoholic drinks and cigarettes and cigars.
- FDI in print media sector allowed up to 26% of paid-up capital of Indian entities publishing periodicals and newspapers dealing with news and current affairs.

International Project Appraisal

As against a domestic project, an international project is exposed to new sources of risk such as currency risk, country risk, repatriation risk etc. Moreover, there are certain issues involved in international projects which are not encountered in domestic projects such as international taxation,

blocked funds, transfer pricing, illegal transfers, etc. This makes the NPV criterion unsuitable for international project evaluation. Instead we apply the Adjusted Present Value (APV) criterion.

However, in our curriculum, such complicated issues are not given. In the absence of such issues, we can apply the NPV criterion by two methods – domestic currency approach and foreign currency approach. Both will yield the same result.

-----End of Section-----

Foreign Exchange - Question Bank

1. Bank A in India provides the following quote –

Rs/ \$	40.40/ 40.70
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 - i) Interpret the above quote.
 - ii) Find out the bid ask spread and express it as a % of the mid rate?
 - iii) What are the factors on which the bid ask spread depends?

2. Bank A in India quotes Rs/ \$ = 45.10/ 46.00
 - a. An Indian firm has imported goods from US and needs to pay \$ 10, 00,000. What amount of Rs would be required?
 - b. An American student has to pay Rs 5, 00,000 for an Indian course. What amount of \$ would be required?
 - c. An Indian company has surplus funds of Rs 40, 00,000 and wants to invest in US. It therefore needs to convert Rupee into \$. What amount of \$ will it get?

3. Consider the following quotation:

Bank A	Rs/ £	92.50/ 92.70
Bank B	Rs/ £	92.60/ 92.80

Check for **two way arbitrage**.

4. Bank A in India and Bank B in US provide the following quotes:

Bank A	Rs/ \$	41.70/ 30
Bank B	\$/ Rs	0.0205/ 0.0215

Find out the **Synthetic quote** and check for **arbitrage**.

5. Suppose an Indian importer has to pay a Newzeland export firm. Direct quote between Indian Rupee & Newzeland Dollars is not available. Find out **cross rates** between Rupee and Newzeland dollar with the help of following quotes.

Rupee/ US \$	48.05/ 48.21
Newzeland \$/ US \$	1.7908/ 1.8510

6. Bank A, B & C provide the following quotes

Bank A	Rs/ £	91.40/ 91.70
Bank B	Rs/ \$	42.50/ 43.10
Bank C	\$/ £	2.1040/ 2.1070

Show the process of **3 way arbitrage** which starts by selling Rs 10000 to Bank A.

7. Given the following:

\$/£	1.3670/1.3708
SFr/DM	1.0030/1.0078
\$/SFr	0.8790/0.8803

And if, DM/£ in the market are 1.5560/1.5576, find out if any arbitrage opportunity exist. If so, how can \$ 10000 available with you be used to generate risk-less profit?

8. Consider the following quotations by 3 banks.

A	\$/ £	2.1050/ 2.1090
B	€/ £	1.8950/ 1.9010
C	\$/ €	1.0150/ 1.0180

Check for **3 way arbitrage** and carry out the same using £ 10000. (Use Cross rates)

9. Based on six month forward rate of Rs. 42.60, the annualised forward discount on \$ happens to be 10%. Find out the spot rate.
10. Based on three month forward rate of \$ 2.1020/ £. The annualised forward premium on \$ against £ happens to be 12%. Find out the spot rate.
11. Given spot $\text{Rs}/ \$ = 42$
 6 month forward $\text{Rs}/ \$ = 42.80$
- Find out the annualised forward premium/ discount on \$ against Rs.
 - Find out the annualised forward premium/ discount on Rs. Against \$.
12. Based on the 3 month forward rate of Rs. 85.70/ £, the annualised forward premium on £ against Rs. Happens to be 9%.
 Find out the annualised forward premium/ discount against £ based on 6 month forward rate of Rs 89/ £.
13. Based on the 3 month forward rate of Rs. 51.65/ €, the annualised forward premium on € against Rs. Happened to be 4%. Find out the 6 month forward rate (Rs/ €) given that the annualised discount on Rs against € based on 6 month forward rate is 7%.
14. Given Spot Rs/ \$ 41.60/ 41.90
 1 month swap points 40/ 50
 2 month swap points 90/ 110
 Compute the **Forward rate**.
15. Given Spot \$/ £ 2.1150/ 70
 1 month swap points 70/ 50
 2 month swap points 110/ 100
 Compute the **forward rates**.
16. An Indian firm has imported goods from Europe and has a payable of € 40000, 3 months from now. To cover the payable, in the forward market, it approaches its banker. The banker informs that Rs/ € rates are not directly available in India. So the bank decides to arrange a synthetic Rs/ € rate with the help of the rates quoted in Mumbai and New York.
- | | | |
|----------|---------------------|-----------|
| Mumbai | Spot Rs/ \$ | 42.50/ 20 |
| | 3 month swap points | 80/ 90 |
|
 | | |
| New York | Spot \$/ € | 1.1050/80 |
| | 3 month swap points | 120/ 110 |
- Find out the synthetic 3 month forward rate Rs/ € rate that will be quoted to the Indian firm if the bank requires an exchange margin of 0.3%.
17. A US exporter to UK has a £ 1000000 receivable after 3 months. His banker gives the following Quotation-
- | | |
|---------------------|----------------|
| Spot \$/ £ | 1.4050/ 1.4070 |
| 3 month swap points | 110/ 130 |

The exporter has the following forecast for the \$/ £ rate expected to prevail after months.

<u>Spot Rate (\$/ £) after three months</u>	<u>probability</u>
<u>1.4150</u>	<u>0.3</u>
<u>1.4170</u>	<u>0.3</u>
<u>1.4190</u>	<u>0.4</u>

Advice the exporter.

18. An Indian company based at Mumbai needs short term funds of Rs. 50 million for a period of 3 months. The company collected the following information from its banker:

	Rs. / \$	Rs. /£
Spot	48.50/ 55	74.05/ 10
3 month forward	45/ 50	85/ 90

3 month interest rates p.a.

Rs. 9%

\$ 4%

£ 6%

You are required to calculate the annualized effective cost of borrowing,

- a. If the company borrows in USD and
 - Covers the exchange rate risk through forward market
 - Keeps the position open and the spot rate after 3 months turns out to be Rs/ \$ 48.90/ 95.
- b. If the company borrows in pounds and
 - Covers the exchange rate risk through forward market
 - Keeps the position open and spot rate after 3 months turns out to be Rs/ £ 74.75/ 80.

19. The treasurer at an Indian company requires Rs.10 million six months. He is exploring various options of financing and has collected the following information:

	Rs./\$	Rs./£	
<u>Spot</u>	<u>46.90/95</u>	<u>65.35/40</u>	
<u>6m forward</u>	<u>70/90 paisa</u>	<u>90/100 paisa</u>	
<u>Expected spot rate after 6m</u>	<u>47.50/55</u>	<u>66.90/95</u>	
<u>Interest Rate:</u>	<u>Rs.</u>	<u>\$</u>	<u>£</u>
<u>6 months</u>	<u>12.00%</u>	<u>4.00%</u>	<u>5.00%</u>

You are required to advise the treasurer in which currency to borrow, if he

- i. Covers the exchange risk in forward market.
- ii. Keep the open position.

20. A company based in U.S. has surplus funds to the tune of \$5,00,000 for 3 months. The company has obtained the following quotes/information from its bank:

\$/Euro	Spot	0.9079/0.9083
	3 months forward	5/33

\$/E	Spot	1.4554/1.4558
	3 months forward	54/51

3 months interest rate:	
\$	3.00%
£	4.00%
€	2.50%

You are required to advise the company as to the currency, in which it should invest to have more inflow of dollars.

21. Spot rate is Rs 52/ € and annualised forward premium on € against Rs based on 6 month forward happens to be 8%. If six month € interest rate is 5% p.a. Find out the Rs interest rate.

22. Given 3 month forward rate Rs 52/ €.

3 month interest rates	
Rs	8% p.a
€	4% p.a

Find out the spot rate.

23. Based on 3 month forward rate of Rs 86/ £, the annualised forward discount on Rs against £ happens to be 5%. Find out the £ interest rate given that 3 month Rs interest rate is 9% p.a.

24. Given Spot rate	Rs 42.50/ \$
6 month forward rate	Rs 43.10/ \$
6 month Rs interest rate	10% p.a.

Find out the dollar interest rate as per IRP.

25. Given Spot rate	Rs42/ \$
3 month forward rate	Rs 42.7/ \$
Three month interest rate p.a	
Rs	12%
\$	7%

Check for IRP and carry out **covered Interest arbitrage** using \$1000 or Rs 42000.

26. Given Spot (Rs/ \$)	= 46.2
3 month forward rate	= 47.2
3 month Rs interest rate	= 8% p.a.
3 month \$ interest rate	= 2 %

Check for **covered interest rate arbitrage** opportunity for the Indian investor and the US investor.

27. Spot rate	Rs/ \$	42.20/ 42.55
6 month forward rate	Rs/ \$	42.70/ 42.95
6 month interest rate (p.a)		
Rs		11%/ 12%
\$		6%/ 7%

Check for arbitrage from both the Indian and US investor's point of view. Begin with 10000 units of currency.

28. An importer in UK has a payable of Euro 500,000 after 3 months. He has collected the following information from his banker.

Euro/ £ Spot: 1.4200/ 1.4210
 3 month forward: 1.4245/ 1.4256

3 month interest rates p.a.

Euro: 2.60% - 2.80%
 £ 3.00% - 3.20%

Which of the following would you recommend for covering the exposure through?

- Forward market
- Money market

29. Weyden Co is a Dutch based company which has the following expected transactions.

One month: Expected receipt of £ 240000
 One month: Expected receipt of £ 140000
 Three months: Expected receipts of £ 300000

The finance manager has collected the following information:

Spot rate (£ per €) 1.7820 ± 0.0002
 One month forward rate (£ per €) 1.7829 ± 0.0003
 Three months forward rate (£ per €) 1.7846 ± 0.0004

Money market rates for the company:

	Borrowing	Deposit
1 year Euro interest rate	4.9%	4.6%
1 year sterling rate	5.4%	5.1%

Assume that it is now 1 April

Required:

- Calculate the expected Euro receipts in one month and in three months using the forward market.
- Calculate the expected Euro receipts in three months using a money market hedge and recommend whether a forward market hedge or a money market hedge should be used.

30. CQS Plc is a UK company that sells goods solely within UK. CQS Plc has recently tried a foreign supplier in Netherland for the first time and need to pay € 250,000 to the supplier in six months' time. You as financial manager are concerned that the cost of these supplies may rise in Pound Sterling terms and has decided to hedge the currency risk of this account payable. The following information has been provided by the company's bank:

Spot rate (€ per £) 1.998 ± 0.002
 Six months forward rate (€ per £) 1.979 ± 0.004

Money market rates available to CQS Plc:

	Borrowing	Deposit
1 year Pound Sterling interest rates	6.1%	5.4%
1 year Euro interest rates	4.0%	3.5%

Assuming CQS Plc has no surplus cash at the present time.

You are required to evaluate whether a **money market hedge, a forward market hedge or a lead payment should be used to hedge the foreign account payable.**

31. An Indian firm has \$ 100000 payable and £ 200000 receivable 3 months from now.

Given spot Rs/ \$ 43.50/ 43.80
3 month swap points 20/ 30

Spot \$/ £ 2.1045/ 2.1065
3 month swap points 110/ 90

3 month interest rates p.a.

Rs 10%/ 11%

£ 7%/ 8%

\$ 4%/ 5%

How should the firm hedge the payable and receivable – **Forward Cover or Money market Cover?**

32. A US fund brought \$ 100000 into India at the beginning of the year, when the exchange rate was Rs 40/ \$. He invested the corresponding Rs proceeds in the Nifty which was trading at 4000. At the end of the year Nifty trades at 4800. Find out the return to the US investor in dollar terms if –

Case (i) rupee appreciates by 8%.

Case (ii) Rupee depreciates by 8%.

33. An Indian firm needs funds for 1 year. It has the following 3 choices.

a) Rupee Borrowing – interest rate – 10%

b) Dollar Borrowing – interest rate – 6%

c) Yen borrowing – interest rate – 20%

Assuming IRP holds good, find out the effective cost of borrowing on a covered basis in each case.

34. Suppose in the previous sum there is a processing upfront fee of 2% in case of Rs borrowing, also Indian Govt. Has announced a withholding tax of 15% in case of borrowing from outside India. Which currency should the firm borrow?

35. An Indian co. needs to borrow funds for 1 year. It can do so at an interest rate of 10% p.a., in India. Instead, it may do so from U.S. at an interest rate of 4%. Instead, it may do so from Switzerland at an interest rate of 2% p.a. Withholding tax of 15% is applicable in case of funds borrowed from abroad. Assume IRP holds good, in which currency should it borrow?

36. An Indian firm is evaluating a 4 year project in USA. The net cash flow are as shown below:

Year	0	1	2	3	4
Net cash flow(in lacs dollars)	(50)	15	15	15	15

Presently, spot rate is Rs. 48/ \$. Risk free interest rates in India and US are 10% p.a. and 4% p.a. respectively. The rate of return required from the project by the Indian shareholders is 18% p.a. calculate the NPV of the project-

a) From domestic currency point of view

b) From the foreign currency point of view.

37. The following table shows the price of a common basket in different countries.

Country	price
US	\$ 100
UK	£50
India	Rs 4200

Japan ¥ 10,500

Find out the exchange rate of each currency as an indirect quote of US, using absolute PPP.

38. Spot rate 1 year ago Rs 40/ \$
Spot rate now Rs 43/ \$
Inflation last year (India) 8%
Inflation last year (US) 3%

Compute:

- a) Nominal appreciation of \$
b) REER
c) Real appreciation of \$
d) Nominal appreciation of Rupee.
e) Real appreciation of Rupee.
39. An Indian firm borrows \$ 50, 000 for 4 years at an interest rate of 6% p.a. on bullet repayment basis, the interest being paid annually.
Presently the spot rate is Rs 42/ \$. The expected annual inflation in India and US are given below.

<u>Year</u>	<u>(India)</u>	<u>(US)</u>
1	6%	2.5%
2	5%	2.2%
3	5.5%	2%
4	4.5%	1.5%

Find out the effective cost of \$ loan in Rs term assuming PPP holds good

40. AMK Ltd an India based company has subsidiaries in US and UK
Forecasts of surplus funds for the next 30 days from two subsidiaries are as below:

U.S. \$ 12.5 million
U.K. £ 6 million

Following exchange rate information is obtained:

	\$/ Rs	£/ Rs
Spot	0.0215	0.0149
30 days forward	0.0217	0.0150

Annual borrowing/ deposit rates (simple) are available

Rs	6.4%/ 6.2%
\$	1.6%/ 1.5%
£	3.9%/ 3.7%

The Indian operation is forecasting a cash deficit of Rs 500 million.

It is assumed that interest rates are based on a year of 360 days.

Calculate the cash balance at the end of 30 days period in Rs for each company under each of the following scenarios ignoring transactions costs and taxes.

- a) Each company invests/ finances its own cash balances/ deficits in local currency independently.
b) Cash balances are pooled immediately in India and the net balances are invested/ borrowed for the 30 days period.
41. A customer with whom the bank had entered into 3 months forward purchase contract for Swiss Francs 100000 at the rate of Rs 36.25 comes to the bank after two months and requests cancellation of the contract. On this date, the rates are:

Spot CHF 1	Rs 36.30	36.35
1 month forward	Rs 36.45	36.52

Determine the amount of Profit or Loss to the customer due to cancellation of the contract.

42. On April 01, 2003 Swastika Industries, a leading steel importer from Mumbai obtained a forward contract from Citibank Mumbai to buy US \$ 1 million for settling their payable to the supplier in Germany on may 31, 2003. The US Dollars were quoted in the local interbank market as under:

April	01, 03 (Rs. / \$)
Spot	47.19/ 20
1 month forward	9/10 paisa
2 month forward	19/ 20 paisa

On May 01, 2003 the supplier informs the importer that the consignment can be shipped and delivered in June 2003. Hence the importer requested Citibank Mumbai to extend the contract to June 30, 2003. The US Dollars were quoted in the local inter- bank market as under:

May 01, 2003 (Rs. / \$)	
Spot	47.02/ 03
1 month forward	7/ 8 paisa
2 month forward	13/ 14 paisa

Citibank Mumbai quoted the exchange rates by loading a margin of 0.20%. The bank further agreed to offer a better rate by 4 paisa while quoting the rates to the importer.

You are required to calculate the

- Extension charges
- Net cash outflow of the company as on June 30, 2003.

43. On 30th June 2009 when a forward contract matured for execution you are asked by an importer customer to extend the validity of the forward sale contract for US\$ 10000 for a further period of three months.

Contracted rate US\$ 1 = Rs 41.87

The US dollar quoted on 30.6.2009

Spot	Rs 40.4800/ 40.4900
Premium July	0.1100/ 0.1300
Premium August	.2300/ 0.2500
Premium September	0.3500/ 0.3750

Calculate the cost for your customer in respect of the extension of the forward contract.

Rupee values to be rounded off to the nearest rupee.

Margin 0.80% for buying rate

Margin 0.25% for selling rate

44. Jai Bharat Industries exported handicrafts to Germany under a letter of Credit and submitted all the shipping documents to its banker on November 28, 2002. The amount of the receivable is Euro 300000. The bank could negotiate the bill on December 02, 2002 and collected an exchange margin of 0.125%. the spot exchange rates as on November 28, 2002 and December 02, 2002 are given below:

	November 28, 2002	December 02, 2002
Mumbai Rs/ \$	48.00/ 05	47.95/ 99
London \$/ £	1.5665/ 67	1.5668/ 70
Euro/£	1.6100/ 02	1.6097/ 99

You are required to calculate:

- a. The amount of gain or loss to the exporter due to delay in negotiation of bill under the LC.
- b. Actual rupee inflow to the exporter.

45. An Indian company has \$ 100000 payable and \$ 30000 receivable from a UK company. The following rates are quoted

Rs/ £ = 74.60/ 10

\$/ £ = 1.40/ 1.45

Calculate the benefit of netting for the Indian and UK Company.

46. An Indian company has a \$ 100000 payable after 3 months. The US exporter is agreeable to grant a discount of \$ 3000 in case of prompt payment. The following information is furnished.

Spot (Rs/ \$) = 45.60/ 65

3 month swap points = 10/15

The cost of the short term funds for the Indian firm is 13% p.a. Advice the firm?

47. Rajesh Leather Goods Ltd., an Indian manufacturer exports leather goods to USA. The company is exporting 5000 units at a price of \$60. The company has imported some specialty chemicals from Europe to produce the export items. The cost of chemical per unit of leather good stands at Euro 10. The fixed overhead costs per unit come at Rs.250 and other variable overheads, including the freight cost, add up to Rs.1250 per unit. The payments for both exports and imports are due in six months.

The current exchange rates are as follows:

Rs/\$ 46.90

Rs/ Euro 40.40

After six months (at the time of settlement of payments) the exchange rate turns out as follows:

Rs/ \$ 47.90

Rs/ Euro 41.25

You are required to:

- a. Calculate the loss/gain due to transaction exposure.
- b. Based on the following additional information calculate the losses/gains due to transaction and operating exposure if the contracted export price per unit is Rs.2700:

The current exchange rate changes to

Rs/\$: 47.50

Rs/Euro : 40.80

Price elasticity of demand for the company's product in the USA is estimated to be 1.60

The Payments are to be settled at the end of 6th month

48. An Indian importer has a payable of £ 1, 00,000. The seller has given the Indian importer the following two options.

- Pay immediately with a cash discount of 1% on the payable.
- Pay after 3 months with interest at 4% p.a.

The borrowing rate for the importer in Rupees is 12% p.a. The following are the exchange rates as on December 02, 2002.

Rs. / Pound Spot 74.76/ 80

3 month forward 38/ 40

Which of the following two options is advisable for the importer?

49. A firm is contemplating import of a consignment from the USA for a value of US dollars 10000. The firm requires 90 days to make a payment. The supplier has offered 60 days interest free credit and is willing to offer additional 30 days credit at an interest rate of 6% per annum. The bankers of the firm offer a short loan for 30 days at 9% per annum. The bankers' quotation for foreign exchange is:

Spot 1 USD	Rs. 46.00
60 day forward 1 USD	Rs. 46.20
90 day forward 1 USD	Rs. 46.35

You are required to advise the firm as to whether it should

- Pay the supplier in 60 days.
- Avail the supplier's offer of 90 days credit. Show your calculations.

50. Amie operating a garment store in US has imported garments from Indian exporter of invoice amount of Rs 13800000 (equivalent to US \$ 300000). The amount is payable in 3 months. It is expected that the exchange rate will decline by 5% over 3 months period. Amie is interested to take appropriate action in foreign exchange market. The three month forward rate is quoted at Rs 44.50.

You are required to calculate expected loss which Amie would suffer due to this decline if risk is not hedged. If there is loss, then how he can hedge the risk.

51. An MNC company in USA has surplus funds to the tune of \$ 10 million for six months. The Finance Director of the company is interested in investing in DM for higher returns. There is a Double Tax Avoidance (DTAA) in force between USA and Germany. The company received the following information from London:

€/ \$ Spot	0.4040/ 41
6 month forward	67/ 65
Rate of interest for six months (p.a.)	5.95% - 6.15%
Withholding tax applicable for interest income	22%
Tax as per DTAA	10%

If the company invests in £, what is the gain for the company?

52. An Indian company borrows \$ 100000 at 6% p.a. for 2 years on bullet repayment basis, interest Payable semi-annually. The firm decided to use rollover forward cover. The exchange rates are-

Date	Spot Rate	6 month forward rate
01/01/08	42.35/ 55	42.45/ 75
30/06/08	42.85/ 43.05	43.10/ 40
31/12/08	43.25/ 50	43.60/ 90
30/ 06/09	43.95/ 44.15	44.25/ 44.50
31/ 12/ 09	44.65/ 44.85	45.05/ 45.25

Find out the effective cost of funding.

53. A French firm exported certain cosmetic goods to a New York firm, the invoice being \$4,00,000, credit terms 30 days. Spot exchange rate: 1\$ = 0.80 €. Find the gain/ loss to the exporter if Euro strengthens by 5% over the 30 days period. What if Euro weakens by 5% during the period? Make calculations in terms of Euro/ \$. Attempt the question by (a) direct quote (b) indirect Quote.

54. Alert Ltd is planning to import a multipurpose machine from Japan at a cost of 3400 lakhs Yen. The company can avail of loans at 18% interest per annum with quarterly rests with which it can import the machine. However, there is an offer from Tokyo branch of an India based bank extending credit of 180 days at 2% per annum against opening of an irrevocable letter of credit.

Other information:

Present exchange rate Rs. 100 = 340 Yen

180 days forward rate Rs. 345 Yen

Commission charges for letter of credit at 2% per 12 months. Advise whether the offer from the foreign branch should be accepted?

55. Hammer Plc is a UK based company that regularly trades with companies in the USA. Several large transactions are due in five months' time. These are shown below. The transactions are in '000' units of currencies shown.

	Exports to:	Imports from:
Company 1	\$490	£150
Company 2	-	\$890
Company 3	£110	\$750

Exchange Rates	\$/ £
Spot	1.9156- 1.9210
3 months forward	1.9066- 1.9120
1 year forward	1.8901- 1.8945

Annual interest rates available to Hammer Plc:

	Borrowing	Investment
Sterling up to 6 months	5.5%	4.2%
Dollar up to 6 months	4.0%	2.0%

How the five month currency risk should be hedged? Consider Forward and money market operations. What is estimated cash inflow/ outflow on the date of maturity under each of two alternatives i.e. forward and money market operations.

56. Following are the spot exchange rates quoted in three different Forex markets:

USD/ INR	48.30 in Mumbai
GBP/ INR	77.52 in London
GBP/ USD	1.6231 IN New York

The arbitrageur has USD 1, 00, 00,000. Assuming that there are no transaction costs, explain whether there is any arbitrage gain possible from the quoted spot exchange rates.

57. An Indian bank has its Nostro Account with bank of America. From the following details of the transactions of a particular day. Prepare the Nostro Account.

Opening balance	\$20,000 (overdrawn)
Purchased TT	\$ 50,000
Issued DD on New York	\$ 20,000
TT remittance outward	\$ 25,000
Purchased bill of exchange, maturity 1 month	\$75,000
Forward sales	\$ 75,000
Export bills, purchased earlier, realised	\$45,000

What steps the Indian bank will take if it wants to maintain a credit balance of \$20,000 in its Nostro Account.

-----End of Section-----
