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Derivatives

A derivative is a financial contract which derives its value from some under lying 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 –

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

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,

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

= (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 of 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 de 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. 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 <u>Fixed Rate</u> is the rate at which the contract is agreed.
- The <u>Reference Rate</u> is typically LIBOR.
- '<u>α</u>' 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%.

   a. Explain how X Ltd. can use a swap to achieve floating rate funding at a cheaper cost?
   b. 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 it futures are present trading at 2000.
   c. Show the process of arbitrage it 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.
   Lot size = 500 shares.
   Risk free interest rate = 10% p.a. compounded continuously.
   Dividend yield = 4% p.a. compounded continuously.
   Find out the overall profit or loss. Assuming Cost of Carry model holds good.
   ($e^{0.015} = 1.016$; $e^{0.01} = 1.011$)

11. The stock of Reliance Energy trades 1200 while 3 month Future on the stock trade at Rs 1290. The risk free rate of interest is 10% p.a. the stock is expected to provide a dividend yield of 1%. The lot size is 250 shares.
    i. Find out the Theoretical Futures price
    ii. Check for arbitrage and process of arbitrage if the price on maturity turns out to be
        - Case I – 1000
        - Case II – 1500

    What are the limitations of stock future arbitrage?

12. The stock of Ranbaxy at trades 600 while 1 month Future on the stock trade at Rs 590. The risk free rate of interest is 10% p.a. the stock is expected to provide annualised dividend yield of 6%. The lot size is 600 shares.
    i. Find out the Theoretical Futures price,
    ii. Check for arbitrage and process of arbitrage if the price on maturity turns out to be
        - Case I – 500
        - Case II – 700

13. a) What is Cost of Carry model in financial futures?

    b) The price of Rs 100 Wipro Stock as on 31st December, 2004 was Rs 520 and the futures price on the same stock on the same date for March, 2005 was quoted as Rs 550. Other features of the contract and related information are as under.

Time to expiration	3 months (0.25 year)
Borrowing rate	20% p.a
Annual dividend on the stock	15% payable before 31.3.2005

    Based on the above information, calculate futures price of Wipro stock as on 31st December, 2004 and comment thereon.

14. A few months ago, futures have been introduced on the Sensex. An arbitrageur is interested in creating a hypothetical index portfolio to understand the concept of stock index arbitrage and how to gain from it. He has collected the following information:
    - The current index is 3495
    - The dividend yield on the index in 6 months is 4%
    - A six month index futures is currently priced at Rs.3700
    - The rate on 364 day T-bills is 9.5%
    - 70% of the companies included in the index are likely to pay dividend in the next six months.
    - Each futures contract is for a value of 100 times the index.

    You are required to

    a. Calculate the fair price of a six-month index futures contract?
    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 ,

a) Covered call and
b) 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 –

i. Bull call spread
ii. Bear call spread
iii. Bull Put spread
iv. 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.
   a. Scenario 1 – LIBOR after 6 months = 6.5%
   b. 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.
   a. Scenario 1 – LIBOR after 3 months = 3.50%
   b. 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%.
 a) 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
 b) 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 σ = 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

 a) Value of call option on X Ltd's share.
 b) Option Delta for the second six month, in case stock price rises to Rs 440 or falls to Rs 110.
 c) 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
   a. Determine the price of the European put option? Given that Ln(73/70) = 0.042
   b. 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% 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, $I_B < I_A$, 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.

i.e. $\frac{F(A/B) - S(A/B)}{S(A/B)} = \frac{iA - iB}{1 + iB}$

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-

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

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:

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

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

$F = \frac{47.5 \times 1.045}{1.025} = $ 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. Owning 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. Advice 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/ 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/ 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*2 = 18.18%

So new quantity sold   = 10,000*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 $100000, 3 month forward at Rs.45.9 + 0.3 i.e. 46.2/$ (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
   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   Rs/ $ = 42
    6 month forward   Rs/ $ = 42.80

    a. Find out the annualised forward premium/ discount on $ against Rs.
    b. 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.

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

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

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

$/£   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?
 a. Forward market
 b. 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:
a. Calculate the expected Euro receipts in one month and in three months using the forward market.
b. 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 of2% 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.

Year	(India)	(US)
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
a. Extension charges
b. 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 anum. The bankers of the firm offer a short loan for 30 days at 9% per anum. 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
a.   Pay the supplier in 60 days.

b. 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 anum 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 anum 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--

PORTFOLIO MANAGEMENT

1. Consider the following portfolios -

Portfolio	A	B	C	D	E	F
$Rp(\%)$	10	12	15	15	18	19
σp (%)	4	4	6	5	8	7

    a. Define and specify the efficient portfolios.

    b. Find out the optimum portfolio for the following investors-

(i)   X is highly risk averse.

(ii)   Y is risk aggressive.

(iii)   Z has medium risk tolerance level.

    c. What would be the optimum portfolio for an investor whose risk attitude has not been stated?

    d. Find out the optimum portfolio for an investor whose utility function is given by,

$$U = Rp - 0.2\sigma^2 p$$

2. A conservative investor is analysing the shares of Dr. Reddy's Laboratory, which is currently trading at Rs. 1180. For the year 1999-2000, the earning per share (EPS) was Rs. 40. The investor has gathered the following scenarios for the next year with the corresponding probabilities:

EPS/ PE Ratio	20	30
50	0.20	0.35
60	0.30	0.15

You are required to calculate the expected risk and return for the share of Dr. Reddy's Lab.

3. The historical data of return of two securities over the past ten years are given. Calculate the covariance and the correlation coefficient of the two securities:

Years	1	2	3	4	5	6	7	8	9	10
Security 1 (%)	12	8	7	14	16	15	18	20	16	22
Security 2 (%)	20	22	24	18	15	20	24	25	22	20

4. The following table shows information regarding the stock of Hindalco –

Year	Stock price at the end of the year	Dividend of the year
2000	110	5
2001	115	5
2002	123	6
2003	117	7
2004	129	7
2005	134	8
2006	150	8

Find out the expected return and risk of the share.

5. The following table shows information regarding the stock of ITC Ltd –

Year	Stock price at the end of the year	Dividend of the year
2000	100	4

2001	116		3
2002	121		5
2003	113		6
2004	123		4
2005	145		6
2006	150		2

Find out the expected return and risk of the share.

6. Consider two stocks i.e. x and Y:

Stocks	Expected return	Variance & Co- variance (%) ^{2}	
		X	Y
X	12%	100	-60
Y	16%	-60	196

a. Construct the minimum risk portfolio.
b. Find out the benefit of diversification of the minimum risk portfolio.
c. Find out the co- efficient of variation of the minimum risk portfolio.

7. Consider the following data.

Stock	Expected return (%)	Variance- Covariance matrix (%)^2	
		A	B
A	20%	196	-60
B	14%	-60	144

a. Find out the minimum risk portfolio.
b. Find out the benefit of diversification.
c. Find out the coefficient of variation of the minimum risk portfolio.

8. Mr. Shyam Bachhan has constructed two portfolios, the details of which are given below:

Portfolio – 1

securities	Weights	Return	S.D.	Correlation Matrix	
				ICICI	Infosys
ICICI	0.3	18%	10%	1.00	0.75
Infosys	0.7	23%	0.75	0.75	1.00

Portfolio -2

Securities	Weights	Return	S.D	Correlation Matrix		
				ICICI	Infosys	HLL
ICICI	0.3	18%	10%	1.0	0.75	0.86
Infosys	0.4	23%	16%	0.75	1.00	0.68
HLL	0.3	16%	12%	0.86	0.68	1.00

You are required to:

a. Calculate the risk and return on portfolio 1 & 2.
b. Construct a portfolio out of the portfolios 1 & 2 in order to generate a return of 20.50%. Find out the SD of such a portfolio.

9. Consider two stocks A & B and the following portfolios P1, P2, P3, P4 comprising of the stocks A and B-

	P1	P2	P3	P4
W_a	50%	100%	25%	0%
W_b	50%	0%	75%	100%
Rp	16%	14%	?	18%
σ_p	5%	6%	?	8%

Find out the missing figures?

10. Martha Ltd invested on 1.04.2008 in equity shares as below:

Company	Number of shares	Cost (Rs.)
M Ltd	1000 (Rs 100 each)	200000
N Ltd	500 (Rs 10 each)	150000

In September, 2010, M Ltd paid 10% dividend and in October, 2010, N Ltd paid 30% dividend. On 31.03.2009, market price of shares of M Ltd and N Ltd were Rs. 220 and Rs. 290 respectively.

P Ltd has been informed by their investment advisers that:

a. Dividends from M Ltd. and N Ltd for the year ending 31.03.2010 are likely to be 20% and 35% respectively.

b. Probabilities of market quotations on 31.03.2010 are:

Probability Factor	Price of share of M Ltd	Price of share of N Ltd
0.2	220	290
0.5	250	310
0.3	280	330

You are required to:

a. Calculate the average return from the portfolio for year ended 31.03.2009.
b. Calculate the expected average return from the portfolio for the year 2008- 2010.
c. Advice P Ltd of the comparative risk of two investments by calculating standard deviation in each case.

11. The common stock of the Phoenix Company is currently selling for Rs 20/share. Security analysts at Smith Smlarney have assigned the following probability distribution to the price of (and rate of return on) Phoenix stock one year from now:

Price	Rate of return	probability
Rs. 16	-20%	0.25
Rs. 20	0%	0.30
Rs. 24	20%	0.25
Rs. 28	40%	0.20

Phoenix is not expected to pay any dividends during the coming year, and the expected rate of return is 8%. What is the standard deviation of possible rates of return of Phoenix stock?

12. The following table provides a probability distribution on the returns of 2 stocks X and Y.

Probability	Return from X	Return from Y
0.4	40	16
0.3	25	20
0.3	10	28

a. Find out the expected return, risk and coefficient of variation for each stock.
b. Find out the covariance and correlation coefficient between the two stocks.

13. Correlation coefficient for the stock A, B, C, D and E are given below:

Stock	A	B	C	D	E
A	-	0.85	0.60	0.45	0.30
B	0.85	-	0.25	0.10	-0.16
C	0.60	-0.25	-	0.78	0.37
D	0.45	0.10	0.78	-	0.86
E	0.30	-0.16	0.37	0.86	-

Each stock has an expected return of 10% and a SD of 15%. If your entire portfolio is composed of only stock A and you can add more stock to your portfolio, which is the stock that you should select?

14. Consider the following information:

Stock	Return	Variance	Weight in the portfolio
Stock 1	16%	484 (%)²	0.50
Stock 2	13%	256 (%)²	0.50

If the variance of the portfolio is 132 (%)², what is the coefficient of correlation between the stocks?

15. The following table provides the historical returns on the Sensex and the stock of Infosys for the last 5 years –

Period	Return on Sensex	Return on Infosys
1	12%	16%
2	8%	6%
3	15%	20%
4	25%	35%
5	30%	50%

Find out the characteristic line for the stock and interpret its coefficient.

16. Consider the following data on the following stocks-

Stocks	Beta	Returns
A	0.2	7%
B	1.1	12%
C	1.9	15%
D	2.7	20%

Find out the equation for SML.

17. The distribution of return of security 'A' and the market portfolio is given below:

Probability	Return	
	A	B
0.30	30	-10
0.40	20	20
0.30	0	30

You are required to calculate the expected return of security 'A' and the market portfolio 'B' the covariance between the market portfolio and the security and the beta for the security.

18. Turbulent Company's stock and the market had the following returns during the last three years and the same trend is expected to continue in the future:

Year	1	2	3
Market (%)	1	8	0
Turbulent stock (%)	13	9	4

The gilt edged securities are trading at 6%. If equilibrium exists and the expected return on the market is 12%. What is the expected return on Turbulent stock?

19. Mr. India has the following scrips in his portfolio-

Particulars	Beta	Proportion of investment (%)
Ballarpur Industries	0.95	15
GE Shipping	1.1	20
SBI	1.25	30
Ahmadabad Electric Co.	0.8	5
BSES	1.05	20

| Bombay Dyeing | 0.70 | 10 |

Calculate the expected return on his portfolio if the risk free return is 4% and return on market is 14%?

20. Given below is the information of market rates of returns and data from two companies G and H:

	Year 2003	Year 2004	Year 2005
Market (%)	12.0	11.0	9.0
Company A (%)	13.0	11.5	9.8
Company (%)	11.0	10.5	9.5

Required:
   a. Determine the beta coefficients of the shares of Company G and Company H.
   b. Distinguish between Systematic risk and Unsystematic risk.

21. The shares of SMS Ltd are presently trading at a price of Rs 10 per share. The expected dividend by the end of the year is Rs 1 per share while the appreciations of the share price of SMS vis-a-vis the Market Index (presently at 3800) are projected by the analysts as follows:

Price (Rs.)	10	11	12
Market index	4370	4750	5130
probability	0.3	0.40	0.3

What is the beta value for the shares of SMS Ltd?

22. The following table provides the information regarding two stocks-

Stocks	Beta	Returns
A	0.8	7%
B	1.9	12%

Find out the expected return from the stock C, which has a beta of 2.5?

23. Given the risk free rate is 10% and the expected return on the market portfolio is 15%. The following are the expected returns for five stocks with their betas:

Stock	Expected return (%)	Expected beta
A	19	1.5
B	15	0.9
C	17	1.25
D	24.5	0.75
E	25	1.40

Based on this expectation, find out the stocks that are overvalued and undervalued?

24. Suppose the assumptions of CAPM are valid and unlimited borrowing and lending at risk less rate of interest is possible. Compute the blanks in the following table:

Stock	Expected return	Standard Deviation	Beta	Unsystematic risk (%)^2
A	14	-	1.75	12
B	-	6	0.82	5
C	10	-	0.60	18

25. A mutual fund holds the following portfolio:

Stock	A	B	C
Investment(Rs. Crore)	200	200	100
Beta	0.5	2	4

The required rate of return on the market is 14% and that of the above portfolio according to CAPM is 20.40%. The fund manager has proposed to sell C for Rs. 100 crore and use the proceeds to purchase stock 'D' which has a beta of 3. The required rate of return of the portfolio according to CAPM is?

26. Gita has a portfolio of 8 securities, each with a market value of Rs 5000. The beta of the portfolio is 1.28 and the beta of the riskiest security is 1.75. Gita wishes to reduce her portfolio beta to 1.15 by selling the riskiest security and replacing it with a lower beta. What must be the beta of the replacement security?

27. Consider the following information relating to two stocks:

Stock	Expected return (%)	Standard Deviation of return (%)
P	15	30
Q	10	20

The returns of the two stocks exhibit perfect correlation. You are required to determine the return and risk of the following combinations of the two stocks:

   a. 70% of P and 30% of Q
   b. 50% of P and 50% of Q
   c. 30% of P and 70% of Q
   d. 10% of P and 90% of Q

28. The risk preference of Mr. Kumar can be represented by the following utility function:
   $U=E(r) – 0.5 \sigma^2$, where symbols are in standard use.

   Three portfolios for which data are provided below are available for investment by Mr. Kumar.

   Portfolio 1: An investment in an equally weighted portfolio with four securities all of which are perfectly positively correlated with each other.

   The expected return and standard deviation for the securities are as follows:

Security	Expected Return (%)	Standard Deviation (%)
A	4	5
B	16	30
C	13	25
D	21	35

   Portfolio 2: The minimum variance portfolio comprising an investment in a security E and security F which have the risk return characteristics as follows:

Security	Expected Return (%)	Standard Deviation (%)
E	19	33
F	14	28

   The correlation coefficient between securities E and F is 0.5.

   Portfolio 3: A portfolio with an expected return of 16%, a beta of 1.3 and unsystematic risk of 12%. The volatility of market returns is 21%.

   You are required to-

   a. Compute the expected return and risk for each portfolio.
   b. Determine which portfolio Mr. Gupta is likely to select?

You are required to determine whether investing in a combination of all the three stocks in equal proportions is better than investing in any one stock?

29. The following information is available in respect of security X and security Y:

Security	β	Expected rate of return
X	1.8	22.00%
Y	1.6	20.4%

Rate of return of market portfolio is 15.3%. If risk free rate of return is 7%, are these securities correctly priced? What would be the risk free rate of return, if they are correctly priced?

30. A portfolio manager has the following four stocks in his portfolio:

Security	No. Of shares	Mkt price per share	β
Varun Shipping Ltd (VSL)	10000	50	0.9
Chowgle steamship Ltd. (CSL)	5000	20	1.0
Mercatorlines Ltd (ML)	8000	25	1.5
Aurbindo pharma Ltd	2000	200	1.2

Compute the following:

a. Portfolio beta
b. If the portfolio manager seeks to reduce the beta to 0.8, how much risk free investment should he bring in?
c. If the portfolio manager seeks to increase the beta to 1.2, how much risk free investment should he bring in

31. Mr. XYZ has categorized all the available stocks in the market into the following types:
    i. Small cap value stocks
    ii. Small cap growth stocks
    iii. Large cap value stocks
    iv. Large cap growth stocks

He has also estimated the weights of the above categories of stocks in the market index. Furthermore, the sensitivity of returns on these categories of stocks to the three important factors is estimated to be:

Category of Stocks	Weight in the Market Index	Factor I (Beta)	Factor II (price/ Book)	Factor III (Average Capitalization)
Small cap value	10%	0.90	0.75	1.25
Small cap growth	25%	0.80	1.39	1.35
Large cap value	15%	0.85	2.05	6.75
Large cap growth	50%	1.165	2.75	8.65

| Risk Premium | 0.65% | 6.85% | - 3.5% |

The risk free rate of return is 4.5%. Required:

a. Using Arbitrage Pricing Theory, determine the expected return on the market index.
b. Using Capital Asset Pricing Model, determine the expected return on the market index.
C. Mr. XYZ wants to construct a portfolio constituting only the 'small cap value' and 'large cap growth' stocks. If the target beta for the portfolio is one, determine the composition of his portfolio.

32. A market analyst has estimated probable returns under different macroeconomic conditions of the following three stocks:

Stocks	Current Price	Rate of return (%)		
		Recession	Moderate growth	Boom
Polar Informatics	18	-15	10	25
Season Biotech	20	15	8	-4
Good Value Ltd	76	17	20	12

He is exploring if it is possible to make any arbitrage profits from the above information.

33. Consider a 3 factor APT model-

Stocks	F1 (mkt)	F2 (P/B)	F3 (mkt cap)	Return
A	0.9	0.75	1.25	8.85
B	0.8	1.39	1.35	5.99
C	0.85	2.05	6.75	?
D	1.165	2.75	8.65	?

RF = 4.5%; RP1 = 6.85%

Find RP2 and RP3.

Also compute the expected return from C and D.

34. The expected return on equity shares in an economy is affected by four factors i.e. change in GDP growth, change in oil prices, change in monsoon and change in Book value. Assume teh Rf to be 10%. The values of these factors are as follows:

Macro factors:	Value of Macro factor
Change in GDP	6%
Change in Oil Prices	-2%
Change in Monsoon	3%
Change in Book Value	10%

Given the following factor sensitivities of the equity shares of four companies, find the expected return on equity shares of each company.

	Factor Sensitivity			
Factor	Madhav Ltd.	Keshav Ltd.	Krishna Ltd.	Damodar Ltd
Change in GDP	1.50	2.00	0.50	0.20
Change in Oil prices	-1.00	-0.05	-0.10	-0.90
Change in Monsoon	0.20	0.50	2.00	1.50
Change in Book Value	0.25	0.50	0.65	0.55

Murari had Rs. 1,00,000 to invest. He borrowed 100 shares of Damodar Ltd, and sold these at the rate of Rs. 500. He invested Rs. 150000 in the equity shares of other three companies. Find the expected return of the portfolio.

35. A foreign institutional investor proposes to invest $10 million in an Indian security with a beta of 1.10 and standard deviation of returns of 7%. The holding period of investment will be one year. The current rupee- dollar exchange rate is Rs. 45.45/ $. The expected depreciation of rupee against dollar over a period is 2% with a standard deviation of 10%. The expected return from the market portfolio in India is 12% and the correlation between the return on security and the exchange rate is 0.50. The risk free rate of return in India is 5%.
You are required to calculate the expected return and risk to the FII.

36. An investor holds the following stocks in his portfolio. All these stocks were purchased on March 1, 2002 at the following prices:

Name of the company	No. Of shares	Price per share
A	1000	Rs. 28.00
B	4000	Rs. 7.00
C	2000	Rs. 14
D	500	Rs. 56.00

The correlation coefficients of these stocks return with the market and their standards deviation of returns were as follows:

Name of the company	Standard Deviation	Correlation Coefficient with the market index
A	20%	0.95
B	18%	0.85
C	14%	0.72
D	11%	0.45

In February 28, 2003, the market prices and standard deviation of the returns of these four stocks are as follows:

Name of the company	Prices per share	Standard deviation (%)
A	Rs. 34.00	22.00%
B	Rs. 5.50	17%
C	Rs. 10.00	15.50%
D	Rs. 70.00	12.50%

If the standard deviations of the market return is constant at 15% and assuming that correlation coefficients of stock's returns with the market index remains unchanged during last year. Estimate the changes in the proportions of systematic and unsystematic risk of the portfolio.

37. An investor has Rs. 1,00,000 to invest. He wants to obtain a return of 20% on this amount. State the course of his action if return on the market portfolio is 18% and risk free rate of return is 13%. If the SD of the market portfolio is 5, what is the standard deviation of his action?

38. XYZ Limited pays no taxes and is entirely financed by equity shares. The equity share has a beta of 0.6, and is priced to offer an expected return of 20%, XYZ Ltd. Now decides to buyback half of the equity shares by borrowing an equal amount. If the debt yields a risk free return of 10%, calculate:
a. The beta of the equity shares after buyback.
b. The required return and risk premium on the equity shares before buyback.
c. The required return and risk premium on the shares after buyback.
d. The required return on debt.
e. The percentage increase in expected earnings per share.
f. The new price earnings multiple.

Efficient Market Hypothesis

39. Mr A Shyam is testing the weak form efficient market hypothesis on the Indian stock market. For this he has collected the data on a leading market index for the last 15 trading days. This is given below:

Trading day	Market Index
1	4500
2	4550
3	4400
4	4350

5	4300
6	4330
7	4400
8	4445
9	4440
10	4370
11	4380
12	4365
13	4500
14	4560
15	4600

Using runs test, verify the validity of the weak form of market efficiency in the Indian stock market at the significance level of 5% and 10%.

40. The closing values of the Sensex during the month of may 2012 are as follows:

Date	Closing value of Sensex
2 May	3372.56
3 May	3380.61
6 May	3384.35
7 May	3423.75
8 May	3435.06
9 May	3462.01
10 may	3431.32
13 May	3442.49
14 May	3420.33
15 May	3395.59
16 May	3355.61
17 May	3333.76
20 May	3282.81
21 May	3186.53
22 May	3175.49
23 May	3114.05
24 May	3255.62
27 may	3243.41
28 may	3146.83
29 May	3160.24
30 May	3149.25

Using runs test, verify the validity of the weak form of market efficiency in the Indian stock market at the significance level of 5% and 10%.