

# Question Paper

## Portfolio Management and Mutual Funds - I (MSF2D3) : January 2008

### Section A : Basic Concepts (30 Marks)

- This section consists of questions with serial number 1 - 30.
- Answer all questions.
- Each question carries one mark.
- Maximum time for answering Section A is 30 Minutes.

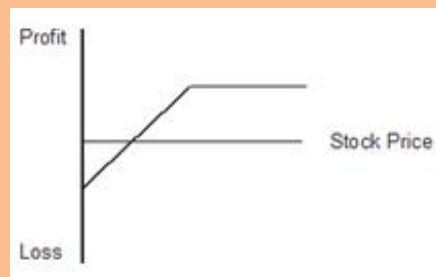
1. Which of the following is/are **not true** with respect to asset allocation?

[<Answer>](#)

- Strategic asset allocation is generally undertaken periodically.
  - Tactical asset allocation considers the changes in risk tolerance level of the investor.
  - Strategic asset allocation indicates the long term asset allocation policy of the portfolio manager.
  - Insured asset allocation aims to achieve the objectives of the investor by timing the market.
- Only (I) above
  - Only (II) above
  - Only (III) above
  - Both (II) and (IV) above
  - Both (III) and (IV) above.

2. Consider the folloiwng pay-off diagram:

[<Answer>](#)



The payoff diagram shown above is indicated by

- Short put.
  - Long put.
  - Covered call.
  - Short call.
- Only (I) above
  - Only (IV) above
  - Both (I) and (III) above
  - Both (II) and (III) above
  - Both (II) and (IV) above.

3. There will be no conflict in ranking between Sharpe's ratio and Treynor's ratio, if the portfolio has

[<Answer>](#)

- Zero unsystematic risk
- Zero systematic risk
- Zero total risk
- Large number of assets
- Equal amount of systematic risk and unsystematic risk.

4. The relationship between the returns of a mutual fund and the returns on market is given by

[<Answer>](#)

$$R_p = a_p + b r_m + c r_m^2$$

Where the notations are in their standard use.

If the value of  $c$  in the above equation is zero,

- The curve depicting the relationship between market returns and portfolio returns becomes steeper as value of  $r_m$  increases.
- The curve depicting the relationship between market returns and portfolio returns becomes milder as value of  $r_m$  decreases.
- The fund manager has concentrated only on market timing.

IV. The fund manager has concentrated only on selection skills.

- (a) Only (I) above
- (b) Only (IV) above
- (c) Both (I) and (II) above
- (d) Both (II) and (III) above
- (e) Both (I) and (IV) above.

5. Mr. Agarwal holds a portfolio of Rs.245 lakh which is inclusive of equity and cash components. The beta of equity component is 0.96. He is expecting an uptrend in the market in future. To gain from his expectation, he wants to increase the beta of his total portfolio to 1.2 by buying 29 contracts on Nifty futures. If the current Nifty futures are available at 5,700 and the multiple attached to it is 50, the values of equity and cash in his total portfolio are respectively

[<Answer>](#)

- (a) Rs.175.425 lakh and Rs.69.575 lakh
- (b) Rs.186.342 lakh and Rs.58.658 lakh
- (c) Rs.194.542 lakh and Rs.50.458 lakh
- (d) Rs.208.148 lakh and Rs.36.852 lakh
- (e) Rs.220.156 lakh and Rs.24.844 lakh.

6. The coefficient of correlation between the returns of Infosys and Sensex is 1.1. The expected returns on the stock of Infosys and Sensex are 18% and 14.37% respectively. 182 day T-Bills are trading in the market at the price of Rs.96.95 each. If the standard deviation of Sensex's return is 17%, the standard deviation of the returns of Infosys is

[<Answer>](#)

- (a) 20.12%
- (b) 22.41%
- (c) 25.46%
- (d) 26.95%
- (e) 28.75%.

7. The residual variance of returns of stock of GAIL is  $48(\%)^2$  and its beta is 1.4. If the variance of the returns on Nifty is  $150(\%)^2$ , the coefficient of correlation of returns of GAIL's stock with those of Nifty is

[<Answer>](#)

- (a) 0.50
- (b) 0.71
- (c) 0.84
- (d) 0.89
- (e) 0.93.

8. Consider the following information:

[<Answer>](#)

| Portfolio | Realized return (%) | $\beta$ |
|-----------|---------------------|---------|
| P         | 20.0                | 1.5     |
| Q         | 17.3                | 1.2     |
| R         | N.A                 | 1.7     |

If the portfolio prices and returns are in equilibrium, the realized return on portfolio R is

- (a) 20.4%
- (b) 20.8%
- (c) 21.2%
- (d) 21.5%
- (e) 21.8%.

9. The utility from a portfolio for Mr. Tiwari is 8.12%. If the expected return and standard deviation of returns of the portfolio are 12.5% and 14.5% respectively, his level of risk tolerance is

[<Answer>](#)

- (a) 32%
- (b) 38%
- (c) 42%
- (d) 48%
- (e) 54%.

10. Which of the following assumptions is/are common to both Markowitz Model and CAPM?

[<Answer>](#)

- I. All investors have uniform, single period investment horizon.
- II. Borrowing and lending at the risk free rate are unrestricted.
- III. Investors choose portfolios on the basis of their expected mean and variance of return.

- (a) Only (I) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (I) and (III) above
- (e) Both (II) and (III) above.

11. Which of the following statements is/are **true** according to the geometric mean model of the portfolio selection? [<Answer>](#)

- I. This model leads to selection of portfolio that fit into the mean-variance model.
  - II. The selection of the portfolio can be made without any analysis of the utility function of the investor and the distribution of the stock returns.
  - III. The selection of the portfolio should take place based on utility maximization rather than the ending wealth.
- (a) Only (I) above
  - (b) Only (II) above
  - (c) Only (III) above
  - (d) Both (I) and (II) above
  - (e) Both (II) and (III) above.

12. A portfolio management organization analyzes 68 stocks and constructs a mean-variance efficient portfolio that is constrained to these 68 stocks. The number of estimates of expected returns, variances and covariances needed to optimize this portfolio are [<Answer>](#)

- (a) 68, 136, 2278
- (b) 68, 68, 2700
- (c) 68, 68, 2775
- (d) 68, 68, 2278
- (e) 68, 136, 2775.

13. Betas of stocks of Dena Bank and Andhra Bank are 0.8 and 1.1 respectively. If the standard deviation of the market returns is 25%, the covariance between the returns of stocks of two banks is [<Answer>](#)

- (a)  $116.71(\%)^2$
- (b)  $229.70(\%)^2$
- (c)  $368.89(\%)^2$
- (d)  $463.00(\%)^2$
- (e)  $550.00(\%)^2$ .

14. Mr. Murthy is considering two securities Alpha and Sigma, whose standard deviations of returns are equal. If he is able to construct a minimum variance portfolio by investing equally in these two securities, the coefficient of correlation between the returns of these two securities can be [<Answer>](#)

- I. Perfectly positive.
  - II. Perfectly negative.
  - III. Zero.
- (a) Only (I) above
  - (b) Only (III) above
  - (c) Both (I) and (II) above
  - (d) Both (I) and (III) above
  - (e) Both (II) and (III) above.

15. There are three portfolios with the following risk and return characteristics: [<Answer>](#)

| Portfolio | E ( $r_i$ ) | Beta |
|-----------|-------------|------|
| X         | 19.00       | 1.50 |
| Y         | 14.50       | 0.94 |
| Z         | 14.00       | 0.80 |

If Arbitrage Pricing Theory holds good, riskless profit strategy would be

- (a) Constructing a hypothetical portfolio by allotting 50% weight each of X and Z, short selling the hypothetical portfolio and going long on portfolio Y
- (b) Constructing a hypothetical portfolio by allotting 20% weight to X and 80% to Z, short selling the hypothetical portfolio and going long on portfolio Y
- (c) Constructing a hypothetical portfolio by allotting 20% weight to X and 80% to Z, short selling portfolio Y and going long on hypothetical portfolio
- (d) Constructing a hypothetical portfolio by allotting 80% weight to X and 20% to Z, short selling portfolio Y and going long on hypothetical portfolio
- (e) Constructing a hypothetical portfolio by allotting 60% weight to X and 40% to Z, short selling hypothetical portfolio and going long on portfolio Y.

16. According to BIRR model, the following are the sensitivities associated with a stock for different risk factors: [<Answer>](#)

| Risk Factor       | Estimated Factor Sensitivity | Estimated Market price for Risk (%) |
|-------------------|------------------------------|-------------------------------------|
| Confidence risk   | 0.70                         | 4.2                                 |
| Time horizon risk | 0.80                         | 2.4                                 |

|                     |       |      |
|---------------------|-------|------|
| Inflation risk      | -0.80 | -1.9 |
| Business Cycle risk | -     | 1.9  |
| Market Timing risk  | 1.60  | 1.4  |

If the risk-free rate is 5.6% and the expected return on the stock is 11.94%, estimated factor sensitivity associated with business cycle risk is

- (a) +0.9
- (b) -1.1
- (c) -1.2
- (d) +1.1
- (e) +1.2.

17. Interest rate anticipation strategy under active bond management requires

[<Answer>](#)

- I. Forecasting the direction and quantum of change in the interest rate.
- II. Investing in long maturity and low coupon bonds when interest rates are expected to rise.
- III. Investing in short maturity and high coupon bonds when interest rates are expected to rise.
- IV. Investing in long maturity and low coupon bonds when interest rates are expected to decline.

- (a) Only (I) above
- (b) Only (II) above
- (c) Both (II) and (III) above
- (d) Both (III) and (IV) above
- (e) (I), (III) and (IV) above.

18. Based on the current dividend yields and expected growth rates, the expected rates of return on stocks of Ranbaxy and Syndicate bank are 15% and 17% respectively. The beta of stock of Ranbaxy is 0.9 and that of stock of Syndicate bank is 1.4. The T-bill is currently traded in the market at 6.8% and the expected rate of return on the SENSEX is 15%. If you currently hold a well-diversified portfolio, which of the two stocks will you add to your portfolio?

[<Answer>](#)

- (a) Stock of Ranbaxy, since its expected return is equal to that of Sensex
- (b) Stock of Syndicate bank, since it has higher expected return of 17%
- (c) Stock of Syndicate bank, since it has a positive residual return of 1.28%
- (d) Stock of Ranbaxy, since it has a lower  $\beta$  of 0.9
- (e) Stock of Ranbaxy, since it has a positive residual return of 0.82%.

19. Assume that all stocks in the economy have a beta of 1 on the market index. Firm specific returns have a standard deviation of 45%. An analyst studies 30 stocks and finds that one-half have an alpha of 3% and the other half an alpha of -3% each. He buys Rs.10 million of an equally weighted portfolio of the positive alpha stocks and shorts Rs.10 million of an equally weighted portfolio of the negative alpha stocks. The expected return and the standard deviation of analyst's returns are respectively

[<Answer>](#)

- (a) Rs.2,00,000 and 7.71%
- (b) Rs.3,00,000 and 7.71%
- (c) Rs.3,00,000 and 8.22%
- (d) Rs.6,00,000 and 8.22%
- (e) Rs.6,00,000 and 9.24%.

20. Equity portfolio has an expected return of 15% and a standard deviation of 22%. Bond portfolio has an expected return of 18% and a standard deviation of 18%. Rational investors will

[<Answer>](#)

- (a) Sell bond portfolio and buy equity portfolio
- (b) Borrow at the risk free rate and buy equity portfolio
- (c) Sell equity portfolio and buy bond portfolio
- (d) Borrow at the risk free rate and sell bond portfolio
- (e) Lend at the risk free rate and buy equity portfolio.

21. Which of the following statements is/are **true** with respect to different types of equity styles?

[<Answer>](#)

- I. Contrarian managers invest in stocks that are selling at low values compared to their book values.
- II. Earnings momentum growth style managers look for low volatility in earnings and an above average rate on the whole.
- III. Yield managers are those that look for companies with above average dividend yields.

- (a) Only (II) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (I) and (III) above
- (e) Both (II) and (III) above.

22. Which of the following is/are **not true** with respect to Stress Testing?

[<Answer>](#)

- I. Stress Testing involves comparison of the value of a portfolio of exposures or assets under various market assumptions.
- II. Stress Testing helps in providing additional risk information, which a portfolio manager needs to know.
- III. Simulated situations developed in stress testing can not provide any estimate of the worst possible scenarios, which a portfolio manager is likely to encounter.

- (a) Only (I) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (II) and (III) above
- (e) All (I), (II) and (III) above.

23. Making forecasts or predictions based on the low quality data may not be always correct because of the existence of the human element in such data. Which of the following can be attributed to the failure of economic forecasts?

- I. Non-linear perceptions.
- II. Group think.
- III. Messenger syndrome.

- (a) Only (I) above
- (b) Only (III) above
- (c) Both (I) and (II) above
- (d) Both (I) and (III) above
- (e) Both (II) and (III) above.

[<Answer>](#)

24. Which of the following is **not true** in the context of style analysis in asset allocation?

- (a) It involves the use of quadratic programming
- (b) It determines a fund's exposure to the changes in returns of the asset classes
- (c) The objective of this analysis is to find the best asset class exposure that sums up to 100%
- (d) The goal of this analysis is to select a style that minimizes the variance of the difference between the return of the fund and the active portfolio with the same style
- (e) The goal is to infer about the funds exposure as much as possible to variations in returns of the asset classes.

[<Answer>](#)

25. An investor has constructed a strap strategy using the following options available on the stock of Ranbaxy.

| Option | Strike price (Rs.) | Premium (Rs.) |
|--------|--------------------|---------------|
| Call   | 420                | 4.0           |
| Put    | 420                | 28.0          |
| Call   | 400                | 4.5           |

If the investor closes his position, when the stock is selling at Rs.410 per share, profit/loss is

- (a) Rs.18 profit
- (b) Rs.36 loss
- (c) Rs.26 profit
- (d) Rs.36 profit
- (e) Rs.26 loss.

[<Answer>](#)

26. The following is the information pertaining to stocks of two companies in a portfolio:

| Stock    | Market Value (Rs.) | Residual Risk (%) <sup>2</sup> | Variance (%) <sup>2</sup> |
|----------|--------------------|--------------------------------|---------------------------|
| Petronet | 10,00,000          | 96                             | 266                       |
| ONGC     | 10,00,000          | 153                            | 423                       |

If return on Sensex is 17%, variance of returns on Sensex is 260 (%)<sup>2</sup> and T-bill rate is 6.8%, the expected return on the portfolio is approximately

- (a) 12.50%
- (b) 13.75%
- (c) 14.50%
- (d) 15.66%
- (e) 16.13%.

[<Answer>](#)

27. Consider the following information pertaining to coefficient of correlations of returns between different stocks:

| Stocks | MTNL | HPCL  | SAIL  | NTPC | ITC   |
|--------|------|-------|-------|------|-------|
| MTNL   | -    | 0.58  | 0.72  | 0.54 | 0.13  |
| HPCL   | 0.58 | -     | -0.52 | 0.30 | -0.38 |
| SAIL   | 0.72 | -0.52 | -     | 0.36 | 0.47  |
| NTPC   | 0.54 | 0.30  | 0.36  | -    | 0.64  |
| ITC    | 0.13 | -0.38 | 0.47  | 0.64 | -     |

[<Answer>](#)

Each stock has an expected return of 14% and a standard deviation of 20%.

If your entire portfolio is composed of only stock of MTNL and you can add one more stock to your portfolio, the stock that you should select is

- (a) HPCL
- (b) SAIL
- (c) MTNL
- (d) ITC
- (e) Insufficient information.

[<Answer>](#)

28. If a portfolio manager consistently obtains a high Sharpe's measure,

- I. The portfolio manager has exhibited above average forecasting ability.
- II. The portfolio manager has exhibited above average selection ability.
- III. The market supports market efficiency in strong form.
- IV. Nothing could be concluded as it may be due to chance.

- (a) Only (II) above
- (b) Only (IV) above
- (c) Both (I) and (II) above
- (d) Both (II) and (III) above
- (e) (I), (II) and (III) above.

[<Answer>](#)

29. Mr. Sukanth is managing a portfolio of Rs.1 million. His target duration is 11 years. He is planning to choose from two bonds: a zero-coupon bond with a maturity of 6 years and a perpetual bond, each currently yielding 8% p.a. The proportions of investment to be made in each of the bonds respectively are

- (a) 33.33% and 66.67%
- (b) 68.75% and 31.25%
- (c) 72.55% and 27.45%
- (d) 86.28% and 13.72%
- (e) 90.25% and 9.75%.

[<Answer>](#)

30. The difference between the payoff diagrams of a straddle and strangle for a buyer is

- (a) The straddle is a more defensive strategy
- (b) The payoff for a straddle has a flat base
- (c) The payoff for a strangle has a flat base
- (d) Strangle is more profitable when prices are volatile on the downside
- (e) A straddle buyer does not assign equal probabilities to rise and fall in the prices of underlying security.

### END OF SECTION A

## Section B : Problems (50 Marks)

- This section consists of questions with serial number 1 – 5 .
- Answer all questions.
- Marks are indicated against each question.
- Detailed workings should form part of your answer.
- Do not spend more than 110 - 120 minutes on Section B.

1. The following is the information pertaining to the stocks of Essar Oil and Ceat Ltd.:

[<Answer>](#)

| Stock     | Expected Return (%) | Standard Deviation (%) |
|-----------|---------------------|------------------------|
| Essar Oil | 14                  | 18                     |
| Ceat Ltd. | 22                  | 48                     |

You are **required** to

a. Calculate the minimum variance portfolio, if the returns of both the stocks have perfect positive correlation and the short sale of securities is possible. What would be your answer, if short sale of securities is not possible?

( 3 marks)

b. Calculate the minimum variance portfolio, if the returns of both the stocks have perfect negative correlation.

( 2 marks)

c. Determine whether you would invest in the stocks of Essar oil and Ceat Ltd. or not in case of both perfect negative and perfect positive correlation (with and without short selling). Also identify whether there is any arbitrage opportunity or not, if you are able to invest in T-bills at 6.5% p.a.

( 4 marks)

d. Assume that there exists a large number of assets that are exact 'clones' of the stock of Essar oil, i.e., they have the same expected return and the same standard deviation. What is the standard deviation of a large, well-diversified portfolio of these securities, if the correlations of the returns between any pair of them are +1, +0.5 and 0?

( 3 marks)

[<Answer>](#)

2. Consider the following information pertaining to three stocks:

| Stock          | Expected Monthly Return (%) |
|----------------|-----------------------------|
| Reliance Petro | 2.20                        |
| DLF            | 10.7                        |
| NTPC           | 7.92                        |

A fund manager wants to construct a portfolio consisting of these three stocks so as to generate a monthly return of 3%. The variance-covariance matrix for these three stocks is as follows:

**Variance-Covariance Matrix (%)<sup>2</sup>**

|                | Reliance Petro | DLF | NTPC |
|----------------|----------------|-----|------|
| Reliance Petro | 100            | 310 | 180  |
| DLF            | 310            | 400 | 360  |
| NTPC           | 180            | 360 | 900  |

You are **required** to calculate the proportions of funds to be invested in each of the three stocks so as to generate target return with the least possible risk.

( 10 marks)

3. Mr. Singhania, a fund manager of a pension fund, is managing a portfolio of Rs.500 crore. He has pension obligations for a period of 7 years, the first payment of which will commence from the end of first year from now. His first pension obligation is expected to be Rs.30 crore and is expected to increase 25% every year. The cost of such liabilities in the market is 10%. He is planning to invest in the following two bonds to immunize his obligations.

[<Answer>](#)

| Bond               | Face Value (Rs.) | Current Market Price (Rs.) | Maturity (Years) | Coupon Rate (%)     |
|--------------------|------------------|----------------------------|------------------|---------------------|
| Fixed Rate Bond    | 1,000            | 940                        | 7                | 11                  |
| Floating Rate Bond | 100              | 99.2                       | 5                | On year Mibor + 0.5 |

Currently one year Mibor rate is 8% which is likely to increase by 0.25% p.a for the next 2 years. After 2 years, Mibor rate is expected to decline by 0.15% p.a in the 4<sup>th</sup> and 5<sup>th</sup> years.

You are **required** to calculate the proportion of fund to be invested in each of the bonds so that the fund manager's liability is completely immunized.

( 10 marks)

4. The investment portfolio of Mr. Surendar consists of stock of IDFC and risk-free fixed income securities in the ratio of 1:1. Current market value of the portfolio is Rs.300 lakh. He would like to use the Constant Ratio Plan for revision of the portfolio. The target ratio for the aggressive stock and the risk-free fixed income securities is 1:1. He rebalances the portfolio whenever the actual ratio deviates from the target ratio by 10 percent or more. The current market price of stock of IDFC is Rs.200.

[<Answer>](#)

After his investment, changes in the price of the stock are as follows.

| Day | Price (Rs.) | Day | Price (Rs.) |
|-----|-------------|-----|-------------|
| 0   | 200         | 7   | 290         |
| 1   | 210         | 8   | 270         |
| 2   | 225         | 9   | 260         |
| 3   | 240         | 10  | 240         |
| 4   | 260         | 11  | 230         |
| 5   | 280         | 12  | 210         |
| 6   | 300         | 13  | 200         |

You are **required** to show how the rebalancing of the portfolio can be carried out.

( 8 marks)

5. Mr. Manish is bullish on Syndicate bank stock and believes that its price rises in future due to its good performance. To benefit from his view, he purchased Syndicate bank shares worth of Rs.10,00,000. On the other hand, he is planning to use February Syndicate bank stock futures to protect himself from the losses of possible decline in the stock price of Syndicate bank. The current stock price of Syndicate bank is Rs.109.84 and February futures price is Rs.108.26. The size of each contract on Syndicate bank futures is 3800. The following is the information pertaining to the prices of Syndicate bank and those of February future prices on that stock for the past 10 days.

[<Answer>](#)

| Days | Price of Syndicate Bank |  |
|------|-------------------------|--|
|------|-------------------------|--|

|    | (Rs.)  | Futures Price on Syndicate Bank Stock (Rs.) |
|----|--------|---------------------------------------------|
| 1  | 95.36  | 95.25                                       |
| 2  | 98.80  | 98.65                                       |
| 3  | 96.85  | 96.48                                       |
| 4  | 98.62  | 99.74                                       |
| 5  | 101.86 | 101.50                                      |
| 6  | 106.45 | 105.65                                      |
| 7  | 111.62 | 110.45                                      |
| 8  | 102.96 | 102.63                                      |
| 9  | 106.53 | 105.63                                      |
| 10 | 109.62 | 108.69                                      |

You are **required** to

- Determine the number of futures contracts to be sold in order to minimize the risk.
- Compute the value of total hedged portfolio, if Mr. Manish liquidates his position on underlying asset and closes his futures position when the stock price of Syndicate bank is Rs.108.14 and futures price is Rs.107.12 respectively.

(8 marks)

(2 marks)

**END OF SECTION B**

### Section C : Applied Theory (20 Marks)

- This section consists of questions with serial number 6 - 7 .
- Answer all questions.
- Marks are indicated against each question.
- Do not spend more than 25 -30 minutes on Section C.

- Indexing strategy is one of passive management strategies. Under this strategy, a bond portfolio is formed with the objective of replicating the performance of a selected index. Explain the advantages and disadvantages of indexing strategy.

[<Answer>](#)

( 10 marks)

- Econometric approach is one of the most formal short-term forecasting approaches. This approach tries to describe the present economic condition as a function of certain policies and variables and the economic relationship attached to these variables. Explain the advantages and problems of using econometric models.

[<Answer>](#)

( 10 marks)

**END OF SECTION C**

**END OF QUESTION PAPER**

## Suggested Answers

### Portfolio Management and Mutual Funds - I (MSF2D3) : January 2008

#### Section A : Basic Concepts

| Answer | Reason                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                               |
|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| 1. D   | Strategic asset allocation is also referred to as long run asset allocation or policy asset allocation and undertaken periodically. Hence, (I) and (III) are correct. In tactical asset allocation, changes in the risk tolerance of investors are ignored. Hence (II) is wrong. Insured asset allocation aims to achieve the objectives of the investor without market timing. Hence (IV) is incorrect. Since statements (II) and (IV) are wrong, alternative (d) is therefore answer. | <a href="#">≤</a><br><a href="#">TOP</a><br><a href="#">≥</a> |
| 2. C   | The profit diagram shown in the question is indicated by both short put and covered call strategy. Hence (c) is the answer.                                                                                                                                                                                                                                                                                                                                                             | <a href="#">≤</a><br><a href="#">TOP</a><br><a href="#">≥</a> |
| 3. A   | Ranking according to Sharpe and Treynor ratio is same, if portfolio is completely diversified i.e. total risk = systematic risk and unsystematic risk is zero Hence (a) is the answer.                                                                                                                                                                                                                                                                                                  | <a href="#">≤</a><br><a href="#">TOP</a><br><a href="#">≥</a> |

4. B When  $C=0$ , the line represented by the equation will become a straight line. This shows that fund did not engage in market timing and concentrated only on stock selection as average beta of the portfolio is fairly constant. If  $C$  is positive, it indicates that the curve become steeper as one moves to the right of the diagram. Hence (IV) is correct. [TOP](#)
5. E  $0.96 \times X + (5700 \times 50 \times 29)/1,00,000 = 245 \text{ lakh} \times 1.2$   
 $0.96 \times X = 294 - (82,65,000/1,00,000) = \text{Rs.}211.35 \text{ lakh}$   
 $X = 211.35/0.96 = \text{Rs.}220.15625 \text{ lakh}$   
The value of equity portfolio = Rs.220.15625 lakh ~220.156  
Cash = Total portfolio – Equity portfolio = 245 – 220.156 = Rs.24.844 lakh [TOP](#)
6. B Return on 182 day T-Bills =  $(100-96.95)/96.95 \times 365/182 \times 100 = 6.31\%$   
 $18 = R_f + \beta (R_m - R_f)$   
 $18 = 6.31 + \beta (14.37 - 6.31)$   
 $11.69 = 8.06\beta$   
 $\beta = 1.45$   
 $\beta = (\sigma_i \rho_{im}) / \sigma_m$   
 $\sigma_i = \beta \sigma_m / \rho_{im} = (1.45 \times 17) / 1.1 = 22.4\%$   
 $r^2 = \beta^2 \sigma_m^2 \rho_{im}^2 = (1.4)^2 \times 1.50 = 2.94$   
 $r = 0.93$  [TOP](#)
7. E At equilibrium condition  
 $R_p = R_f + \beta_A (R_m - R_f)$   
i.e.,  $20 = R_f + 1.5 (R_m - R_f)$  (I)  
Further,  
 $R_Q = 17.3 = R_f + 1.2 (R_m - R_f)$  (II)  
From (I) & (II)  
 $2.7 = 0.3 (R_m - R_f)$   
 $\Rightarrow (R_m - R_f) = 9$   
From (I)  $R_f = 20 - 1.5 \times 9 = 6.5\%$   
 $\Rightarrow R_R = 6.5 + 1.7 \times 9 = 21.8\%$
8. D Utility = [Expected return – (Variance/Risk tolerance)]  
 $8.12 = 12.5 - 14.5^2/\text{Risk tolerance}$   
Risk tolerance =  $14.5^2 / (12.5 - 8.12)$   
Risk tolerance = 48%. [TOP](#)
9. B Under Markowitz portfolio theory investors act as if they make investment decisions on the basis of the expected return and the variance about security return distributions. While under CAPM an extension of Markowitz's theory, all investors are considered to be efficient who like to position themselves on the efficient frontier. Thus the exact location on the efficient frontier depends on their risk-return utility function. [TOP](#)
10. B  
(i) This model leads to selection of portfolios that do not fit into the mean-variance model.  
(ii) The selection of the portfolio can be made without any analysis of the utility function of the investor and the distribution of the stock returns.  
(iii) The selection of the portfolio should take place based on ending wealth rather than the utility maximization.  
Since, statement (II) is true, alternative (b) is answer. [TOP](#)
11. D In order to optimize the portfolio; one would need  
 $N = 68$  estimates of means  
 $N = 68$  estimates of variances  
 $N(N-1)/2 = 2278$  estimates of covariances  
Hence, the correct answer is (d). [TOP](#)
12. E Covariance =  $\beta_1 \beta_2 \sigma_m^2$  [TOP](#)

$$= 0.8 \times 1.1 \times (25)^2$$

$$= 550(\%)^2$$

TOP  
≥

14. E For constructing a minimum risk portfolio the condition to be satisfied is

$$W_S = (\sigma_A^2 - \text{Cov}_{AS}) / (\sigma_A^2 + \sigma_S^2 - 2\text{Cov}_{AS})$$

Let SDs of returns of Alpha and Sigma be 30% each

If perfectly positive,  $= (30^2 - 30 \times 30 \times 1) / (30^2 + 30^2 - 2 \times 30 \times 30 \times 1) = 0$

If perfectly negative,  $= (30^2 - 30 \times 30 \times -1) / (30^2 + 30^2 - 2 \times 30 \times 30 \times -1) = 0.5$

If zero,  $= (30^2 - 30 \times 30 \times 0) / (30^2 + 30^2 - 2 \times 30 \times 30 \times 0) = 0.5$

In the given three scenarios, we can form a minimum variance portfolio when the coefficient of correlation between the returns of two securities is either zero or perfectly negative by investing equally in those stocks.

≤  
TOP  
≥

15. C Portfolio Beta of portfolio having invested 20% weight in X and 80% weight in Z

$$= 0.20 \times 1.5 + 0.80 \times 0.80$$

$$= 0.94$$

$$\text{Portfolio return} = 19 \times 0.20 + 14 \times 0.80 = 15\%$$

If this portfolio is purchased and portfolio Y is sold the beta will be zero and additional return of 0.50 can be achieved. Hence (c) is the answer.

≤  
TOP  
≥

16. C Expected return as per BIRR model

$$= \Sigma (\text{Estimated Factor sensitivity} \times \text{Estimated Market Price for risk}) + \text{Risk free rate}$$

Using the given data, we get

| Estimated Factor Sensitivity | Estimated Market price for Risk (%) |
|------------------------------|-------------------------------------|
| 0.70                         | 4.2                                 |
| 0.80                         | 2.4                                 |
| -0.80                        | -1.9                                |
| x                            | 1.9                                 |
| 1.60                         | 1.4                                 |

$$\text{Expected return} = 5.6 + 0.7 \times 4.2 + 0.8 \times 2.4 + (-0.8) \times (-1.9) + x \times 1.9 + 1.6 \times 1.4 = 11.94\%$$

$$x = -1.2.$$

≤  
TOP  
≥

17. E Interest rate anticipation strategy demands forecasting the direction and quantum of change. Hence (I) is correct. Because interest rate sensitivity is related to bond duration, the general rule for interest rate anticipation is to increase your investment in long duration (long maturity and low coupon bond) when interest rates are expected to decline. This enhances the opportunity to increase total return in the short run through price appreciation. On the other hand, if interest rates are expected to rise, moving into shorten duration bonds (i.e. short maturity and high coupon bonds) aids in preserving capital which in turn can stabilize or increase total return in a market with falling prices. Clearly (III) and (IV) are also correct and (II) is wrong. Hence (e) is the answer.

≤  
TOP  
≥

18. E The  $\alpha$  of stock of Ranbaxy  $= R_x - (R_f + \beta_x (R_m - R_f))$

$$= 15\% - (6.8\% + 0.9 (15\% - 6.8\%))$$

$$= 15\% - 14.18\% = 0.82\%$$

$$\text{The } \alpha \text{ of stock of Syndicate bank} = R_Y - (R_f + \beta_Y (R_m - R_f))$$

$$= 17\% - (6.8\% + 1.4(15\% - 6.8\%))$$

$$= 17\% - 18.28\% = -1.28\%$$

Stock X would be a good addition since it has positive  $\alpha$ .

≤  
TOP  
≥

19. D Shorting equally the negative-alpha stocks and investing the proceeds equally in the positive-alpha stocks eliminates the market exposure and creates a zero-investment portfolio. The expected excess rupee return is  $1,00,00,000 \times 0.03 + (-1,00,00,000) \times (-0.03) = \text{Rs.} 6,00,000$

The beta of this portfolio is zero, because, it is equally weighted, with half of the weights negative and all betas equal to one. Thus, the systematic component of the total risk is also zero. The variance of the analyst's profit is not zero, however, since this portfolio is not well diversified. Total variance amounts to the non-systematic risk.

$$\sigma^2 = \sigma^2_{(ep)} = \sigma^2_{(ei)} / n = 45^2 / 30 = 67.5(\%)^2$$

$$\sigma = 8.22\%.$$

≤  
TOP  
≥

20. C Rational investors buy higher return stock (since it is under priced) with lower standard deviation and sell low return stock (since it is overpriced) with higher standard deviation to make arbitrage profits.

≤  
TOP  
≥

21. D Contrarian managers invest in stocks that are selling at low values compared to their book values. Earnings momentum growth style managers look for high volatility in earnings and an above average rate on the whole. Yield managers are those that look for companies with above average dividend yields. Since statements (II) is false and (I) and (III) are true, alternative (d) is answer. [≤](#)  
[TOP](#)  
[≥](#)
22. B Stress Testing involves comparison of the value of a portfolio of exposures or assets under various market assumptions. Stress Testing helps in providing additional risk information, which a portfolio manager needs to know. Simulated situations developed in stress testing would provide an estimate of the worst possible scenarios, which a portfolio manager is likely to encounter. Since, statements (I) and (II) are true and (III) is false, alternative (b) is answer. [≤](#)  
[TOP](#)  
[≥](#)
23. E Linear perceptions, group think and messenger syndrome can be attributed to the failure of economic forecasts. Hence alternative (e) is answer. [≤](#)  
[TOP](#)  
[≥](#)
24. D Style analysis involves the use of quadratic programming for the purpose of determining a fund's exposure to the changes in returns of the asset classes. The objective of this analysis is to find the best asset class exposure that sums up to 100% .The goal of this analysis is to select a style that minimizes the variance of the difference between the return of the fund and the passive not active portfolio with the same style. The goal is to infer about the funds exposure as much as possible to variations in returns of the asset classes. Hence, alternative (d) is answer. [≤](#)  
[TOP](#)  
[≥](#)
25. E A strap strategy involves buying two calls and one put at same strike price.  
Initial cash out flow =  $2 \times (4) + 28 = 36$   
When the stock price is Rs.410, calls will not be exercised but put option will be exercised. Gain on put =  $(420 - 410) = \text{Rs.}10$   
Total =  $-36 + 10$   
Profit/Loss =  $-\text{Rs.}26$ . [≤](#)  
[TOP](#)  
[≥](#)
26. E [≤](#)  
[TOP](#)  
[≥](#)
- | Stock    | Market Value (Rs.) | Residual Risk | Variance (%) <sup>2</sup> | Systematic Risk | Beta = (Systematic Risk/Market Variance) <sup>1/2</sup> |
|----------|--------------------|---------------|---------------------------|-----------------|---------------------------------------------------------|
| Petronet | 10,00,000          | 96            | 266                       | 170             | 0.81                                                    |
| ONGC     | 10,00,000          | 153           | 423                       | 270             | 1.02                                                    |
- With average beta of the portfolio =  $0.915$   
Expected returns =  $6.8 + 0.915 \times (17 - 6.8)$   
=  $16.133\% \sim 16.13\%$ .
27. D Intuitively, we note that since all stocks have the same expected rate of return and standard deviation, we wish to choose the stock that will result in lowest risk. This will be the one with the lowest correlation with stock returns of MTNL. Among the given stocks, the returns of stock of ITC has the lowest correlation with the returns of stock of MTNL i.e., 0.13. [≤](#)  
[TOP](#)  
[≥](#)
28. C Sharpe's Ratio =  $\frac{r_i - r_f}{\sigma_i}$  i.e., excess return over total risk. Consistent outperformance based on this ratio indicates proper stock/asset selection, which reduces the proportion of unsystematic risk in portfolio. It further indicates better forecasting ability to outperform the market for the level of risk taken. [≤](#)  
[TOP](#)  
[≥](#)
29. A The duration of the perpetuity is  $= (1 + \text{YTM}/\text{YTM}) = 1.08/0.08 = 13.5$  years.  
Let w be the weight of the zero-coupon bond. Then we can find w by solving the following equation  
$$W \times 6 + (1 - w) \times 13.5 = 11$$
$$6W + 13.5 - 13.5W = 11$$
$$W = 0.3333$$
  
Therefore, your portfolio would be 0.3333 or 33.33% invested in the zero coupon bond and 0.6667 or 66.67% in the perpetuity. [≤](#)  
[TOP](#)  
[≥](#)
30. C Among the given alternatives, the only correct statement is that the payoff diagram for strange has a flat base and hence (c) is answer. [≤](#)  
[TOP](#)  
[≥](#)

## Section B : Problems

1. Let the stocks of Essar oil and Ceat Ltd be A and B respectively

- a. Minimum variance portfolio in case of perfect positive correlation

$$\begin{aligned} W_A &= \frac{(18\%)^2 - (18\% \times 4\% \times 1)}{(18\%)^2 - (2 \times 18\% \times 4\% \times 1)} \\ &= \frac{324 - 72}{324 - 144} \\ &= \frac{252}{180} = 1.6 \end{aligned}$$

$$W_B = 1 - W_A = 1 - 1.6 = -0.6$$

Hence, invest 160% in the stock of Essar oil and -60% in the stock of Ceat Ltd.. This requires short selling of stock of Ceat. If short selling of security is not possible, invest 100% in the stock of Essar oil and nothing in the stock of Ceat.

- b. Minimum variance portfolio in case of perfect negative correlation

$$\begin{aligned} W_A &= \frac{(18\%)^2 - (18\% \times 4\% \times -1)}{(18\%)^2 - (2 \times 18\% \times 4\% \times -1)} \\ &= \frac{324 + 144}{324 + 144} \\ &= \frac{468}{648} = 0.72727 \sim 0.7273 \end{aligned}$$

Hence, invest 72.73% in the stock of Essar Oil and 27.27% in the stock of Ceat.

- c. Expected returns are:

Perfect positive correlation (if short sale is possible):

$$E(R) = 1.6 \times 0.14 - 0.6 \times 0.22 = 9.2\%$$

Perfect positive correlation (if short sale is not possible):

$$E(R) = 1.0 \times 0.14 + 0 \times 0.22 = 14\%$$

Perfect negative correlation:

$$E(R) = 0.7273 \times 0.14 + 0.2727 \times 0.22 = 16.18\%$$

Variance of portfolios

Perfect positive correlation:

$$\begin{aligned} \sigma_p^2 &= W_A^2 \sigma_A^2 + W_B^2 \sigma_B^2 + 2W_A W_B \sigma_A \sigma_B \rho_{AB} \\ &= 1.6^2 \times 18^2 + (-0.6)^2 \times 48^2 + 2 \times 1.6 \times -0.6 \times 18 \times 48 \times 1 = 0 \end{aligned}$$

Perfect negative correlation

$$\sigma_p^2 = 0.7273^2 \times 18^2 + 0.2727^2 \times 48^2 + 2 \times 0.7273 \times 0.2727 \times 18 \times 48 \times -1 = 0$$

In both cases (perfect positive and perfect negative correlation) the variance of the minimum variance portfolio is zero.

Since the variances of the portfolios that we created are zero and the expected return is higher than the 6.5% return earned on the T-bill, there is an arbitrage opportunity.

We will choose to buy either of the portfolios constructed above and sell the T-bill. This arbitrage portfolio will earn a positive profit with no risk.

Consequently, when the two assets are perfectly positively correlated, we will hold the stock of Essar oil long and short stock of Ceat. When the assets are perfectly negatively correlated we will hold both assets long.

- d. The variance of a portfolio p can be written as follows:

where  $w_i$  and  $w_j$  where the weights associated with assets i and j. ( $i, j = 1, 2, 3, \dots, N$ )

Since the weights in this question are equal across assets and the assets have the same variance

the portfolio variance can be re-written as follows:

We can also write the above equation as a sum of two terms. The first - a **variance term** and the second - **covariance term**:

Note that there are  $N(N-1)$  different covariance terms that are all identical according to our assumption. Hence, we obtain:

We can substitute into this equation the given correlation coefficients and observe what happens to the portfolio variance.

Coefficient of correlation = +1, In this case there is no gain from adding more assets. The portfolio variance is equal to:

that is the portfolio variance is equal to variance of Essar oil's stock.

Coefficient of correlation = 0.5, In this case there is some gain in diversification as we add more assets to the portfolio.

Coefficient of correlation = 0, In this case the covariance term is equal to zero increasing even further the gains from diversification

2. Let  $X_1$ ,  $X_2$  and  $X_3$  be the proportion of funds to be invested in Reliance Petro, DLF and NTPC. Using the data provided, the portfolio problem can be formulated as

$$Z = 100X_1^2 + 400X_2^2 + 900X_3^2 + 2 \times 310 \times X_1X_2 + 2 \times 180 \times X_1X_3 + 2 \times 360 \times X_2X_3$$

Subject to

$$2.2 X_1 + 10.7X_2 + 7.92X_3 = 3\%$$

$$X_1 + X_2 + X_3 = 1$$

$X_3 = 1 - X_1 - X_2$ . Substituting this in objective function  $Z$ , we get

$$\begin{aligned} Z &= 100X_1^2 + 400X_2^2 + 900(1 - X_1 - X_2)^2 + 620X_1X_2 + 360X_1(1 - X_1 - X_2) + 720X_2(1 - X_1 - X_2) \\ &= 100X_1^2 + 400X_2^2 + 900(1 + X_1^2 + X_2^2 + 2X_1X_2 - 2X_1 - 2X_2) + 620X_1X_2 + 360X_1 - 360X_1^2 - 360X_1X_2 + 720X_2 - 720X_1X_2 - 720X_2^2 \\ &= 100X_1^2 + 400X_2^2 + 900 + 900X_1^2 + 900X_2^2 + 1800X_1X_2 - 1800X_1 - 1800X_2 + 620X_1X_2 + 360X_1 - 360X_1^2 - 360X_1X_2 + 720X_2 - 720X_1X_2 - 720X_2^2 \\ &= 640X_1^2 + 580X_2^2 + 1340X_1X_2 - 1440X_1 - 1080X_2 + 900 \end{aligned}$$

Similarly, we can transform the constraint equation into two variables

$$2.2 X_1 + 10.7 X_2 + 7.92 (1 - X_1 - X_2) = 3$$

$$-5.72X_1 + 2.78X_2 = -4.92$$

$$5.72X_1 - 2.78X_2 = 4.92.$$

Incorporating the above equation in the objective function using a Lagrangian multiplier, we get

$$Z = 640X_1^2 + 580X_2^2 + 1340X_1X_2 - 1440X_1 - 1080X_2 + 900 + \lambda [5.72X_1 - 2.78X_2 - 4.92]$$

$$\frac{\partial Z}{\partial X_1} = 1280X_1 + 1340X_2 + 5.72\lambda - 1440$$

$$\frac{\partial Z}{\partial X_2} = 1160X_2 + 1340X_1 - 2.78\lambda - 1080$$

$$\frac{\partial Z}{\partial \lambda} = 5.72X_1 - 2.78X_2 - 4.92$$

Simplifying the equations, we get

$$1280X_1 + 1340X_2 + 5.72\lambda = 1440$$

$$1160X_2 + 1340X_1 - 2.78\lambda = 1080$$

$$1280X_1 + 1340X_2 + 5.72\lambda = 1440$$

$$1101 + 622.1X_2 + 1340X_2 + 5.72\lambda = 1440$$

$$1101 + 622.1X_2 + 1340X_2 + 5.72\lambda = 1440$$

$$1101 + 622.1X_2 + 1340X_2 + 5.72\lambda = 1440$$

$$1152.59 + 651.26X_2 + 1160X_2 - 2.78\lambda = 1080$$

$$\Rightarrow 1811.26X_2 - 2.78\lambda = -72.59 \dots \dots \dots (B)$$

Multiplying equation (B) by 1.08328, we get

$$1962.1X_2 - 3.01152\lambda = -78.6353 \dots \dots \dots (C)$$

Subtracting equation C from A, we get

$$8.73152\lambda = 417.6353$$

$$\lambda = 47.830767$$

$$\therefore X_2 = 0.033, \quad X_1 = 0.8767, \quad X_3 = 0.0903$$

3. i. **Duration of liability**

| Year              | Cash outflow | P.V. of C.F. (10%) | (P.V. of C.F. x year) |
|-------------------|--------------|--------------------|-----------------------|
| 1                 | 30           | 27.27273           | 27.27273              |
| 2                 | 37.5         | 30.99174           | 61.98348              |
| 3                 | 46.875       | 35.21788           | 105.65364             |
| 4                 | 58.59375     | 40.02032           | 160.08128             |
| 5                 | 73.24219     | 45.47764           | 227.3882              |
| 6                 | 91.55273     | 51.67913           | 310.07478             |
| 7                 | 114.4409     | 58.72628           | 411.084               |
| <b>1303.53811</b> |              | 289.38572          | 1303.53811            |

Duration =  $\frac{289.38572}{1303.53811} = 4.5045$  years

ii. **Duration of bond:****Fixed Rate Bond**

$$940 = 110 \times \text{PVIFA}_{(k,7)} + 1000 \times \text{PVIF}_{(k,7)}$$

If  $k = 12.00\%$

$$= 110 \times 4.564 + 1000 \times 0.452 = 954.04$$

RHS = 954.04

If  $k = 13.00\%$

$$= 110 \times 4.423 + 1000 \times 0.425 = 911.53$$

RHS = 911.53

$$K = \frac{954.04 - 911.53}{954.04 - 911.53}$$

= 12.33%.

Duration of the bond  $\left(1 + \frac{k}{100}\right)^n$

$$r_c = \frac{940}{1000} = 0.94$$

$$D = \frac{0.1233}{1 + 0.1233} \times \left(1 + \frac{0.1233}{100}\right)^7$$

$$= 4.814 + 0.358$$

$$= 5.172 \text{ years approx.}$$

**Floating Rate Bond**

|                      | Coupon Income |   |       |
|----------------------|---------------|---|-------|
| 1 <sup>st</sup> year | 8.00 + 0.50   | = | 8.50% |
| 2 <sup>nd</sup> year | 8.25 + 0.50   | = | 8.75% |
| 3 <sup>rd</sup> year | 8.50 + 0.50   | = | 9.00% |
| 4 <sup>th</sup> year | 8.35 + 0.50   | = | 8.85% |
| 5 <sup>th</sup> year | 8.20 + 0.50   | = | 8.70% |

If YTM of the bond =  $K$

$$99.20 = \frac{8.5}{(1+K)} + \frac{8.75}{(1+K)^2} + \frac{9}{(1+K)^3} + \frac{8.85}{(1+K)^4} + \frac{8.7}{(1+K)^5} + \frac{100}{(1+K)^5}$$

At  $k = 8\%$ ,

R.H.S. = 103

At  $k = 9\%$

$$R.H.S. = 99.03$$

$$K = \frac{103 - 99.03}{103 - 99.03}$$

= 8.96%.

Duration of the floating rate bond

| Year           | Cash inflow | P.V. of Cash flow at (8.96%) | P.V. of Cash flow × year |
|----------------|-------------|------------------------------|--------------------------|
| 1              | 8.5         | 7.8                          | 7.8                      |
| 2              | 8.75        | 7.37                         | 14.74                    |
| 3              | 9           | 6.957                        | 20.871                   |
| 4              | 8.85        | 6.28                         | 25.12                    |
| 5              | 8.7         | 5.665                        | 28.325                   |
| 5              | 100         | 65.11                        | 325.55                   |
| <b>422.406</b> |             | 99.182                       | 422.406                  |

Duration = ~~99.182~~ = 4.26 years

If proportion of fund to be invested in Fixed Rate Bond is  $w$  and  $(1 - w)$  in Floating Rate Bond

$$w \times 5.172 + (1 - w) \times 4.26 = 4.5045$$

$$5.172w + 4.26 - 4.26w = 4.5045$$

$$0.2445 = 0.912w$$

$$w = \frac{0.2445}{0.912} = 26.81\%$$

Investment in Floating Rate Bond

$$= 1 - 0.2681 = 0.7319 = 73.19\%$$

Proportion of fund =

Fixed Rate Bond = 26.81%

Floating Rate Bond = 73.19%

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| Stock Price | Value of Buy and Hold portfolio (Rs. in lakhs) | Value of the Conservative portfolio (Rs. in lakhs) | Value of the Aggressive Portfolio (Rs. in lakhs) | Total value (Rs. in lakhs) | Ratio    | Rebalancing action       | Total No. of shares in aggressive portfolio (in lakh) |
|-------------|------------------------------------------------|----------------------------------------------------|--------------------------------------------------|----------------------------|----------|--------------------------|-------------------------------------------------------|
| 200         | 300                                            | 150                                                | 150                                              | 300                        | 1:1      | –                        | 0.75                                                  |
| 210         | 315                                            | 150                                                | 157.5                                            | 307.5                      | 1.05:1   | –                        | 0.75                                                  |
| 225         | 337.5                                          | 150                                                | 168.75                                           | 318.75                     | 1.125:1  | –                        | 0.75                                                  |
| 225         | 337.5                                          | 159.375                                            | 159.375                                          | 318.75                     | 1:1      | Sell 0.04167 lakh shares | 0.70833                                               |
| 240         | 360                                            | 159.375                                            | 170                                              | 329.375                    | 1.067:1  | –                        | 0.70833                                               |
| 260         | 390                                            | 159.375                                            | 184.17                                           | 343.545                    | 1.1556:1 | –                        | 0.70833                                               |
| 260         | 390                                            | 171.7725                                           | 171.7725                                         | 343.545                    | 1:1      | Sell 0.0477 lakh shares  | 0.66063                                               |
| 280         | 420                                            | 171.7725                                           | 184.9858                                         | 356.7583                   | 1.077:1  | –                        | 0.66063                                               |
| 300         | 450                                            | 171.7725                                           | 198.2                                            | 369.9725                   | 1.154:1  | –                        | 0.66063                                               |
| 300         | 450                                            | 184.98625                                          | 184.98625                                        | 369.9725                   | 1:1      | Sell 0.044 lakh shares   | 0.61663                                               |
| 290         | 435                                            | 184.98625                                          | 178.82                                           | 363.80625                  | 0.967:1  | –                        | 0.61663                                               |
| 270         | 405                                            | 184.98625                                          | 166.487586                                       | 351.473836                 | 0.9:1    | –                        | 0.61663                                               |
| 270         | 405                                            | 175.736918                                         | 175.736918                                       | 351.473836                 | 1:1      | Buy 0.03426 lakh shares  | 0.65089                                               |
| 260         | 390                                            | 175.736918                                         | 169.228143                                       | 344.9651                   | 0.963:1  | –                        | 0.65089                                               |
| 240         | 360                                            | 175.736918                                         | 156.2106                                         | 331.947518                 | 0.89:1   | –                        | 0.65089                                               |
| 240         | 360                                            | 165.9738                                           | 165.9738                                         | 331.947518                 | 1:1      | Buy 0.04068 lakhs shares | 0.69157                                               |
| 230         | 345                                            | 165.9738                                           | 159.058225                                       | 325.032025                 | 0.9583:1 | –                        | 0.69157                                               |
| 210         | 315                                            | 165.9738                                           | 145.2271                                         | 311.2009                   | 0.875:1  | –                        | 0.69157                                               |
| 210         | 315                                            | 155.60045                                          | 155.60045                                        | 311.2009                   | 1:1      | Buy 0.0494 lakhs shares  | 0.74097                                               |
| 200         | 300                                            | 155.60045                                          | 148.1909                                         | 303.79135                  | 0.95:1   | –                        | 0.74097                                               |

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- a. The number of contracts to be sold to minimize the risk is determined based on the risk minimizing hedge ratio, which is represented by beta. The value of beta can be arrived at by regressing the data on futures price and cash market price.

| Day   | Futures price (Rs.) | Stock price (Rs.)  | Return on Futures (X) % | Return on Stock (Y) % | XY     | X <sup>2</sup> |
|-------|---------------------|--------------------|-------------------------|-----------------------|--------|----------------|
| 1     | 95.25               | 95.36              |                         |                       |        |                |
| 2     | 98.65               | 98.8               | 3.57                    | 3.61                  | 12.89  | 12.74          |
| 3     | 96.48               | 96.85              | -2.20                   | -1.97                 | 4.33   | 4.84           |
| 4     | 99.74               | 98.62              | 3.38                    | 1.83                  | 6.19   | 11.42          |
| 5     | 101.5               | 101.86             | 1.76                    | 3.29                  | 5.79   | 3.10           |
| 6     | 105.65              | 106.45             | 4.09                    | 4.51                  | 18.45  | 16.73          |
| 7     | 110.45              | 111.62             | 4.54                    | 4.86                  | 22.06  | 20.61          |
| 8     | 102.63              | 102.96             | -7.08                   | -7.76                 | 54.94  | 50.13          |
| 9     | 105.63              | 106.53             | 2.92                    | 3.47                  | 10.13  | 8.53           |
| 10    | 108.69              | 109.62             | 2.90                    | 2.90                  | 8.41   | 8.41           |
| Total | $\sum X = 1013.87$  | $\sum Y = 1013.87$ | 13.88                   | 14.74                 | 143.19 | 136.51         |

$$\beta = \frac{9 \times 135.27 \cdot (3.87)(14.74)}{10,00,000 \times 1.05 \cdot (13.87)^2} = 1.0459 \sim 1.05$$

The number of futures contracts required to be sold will be

Hence, the risk minimizing position requires selling 2.55 futures contracts. Since we cannot trade in fraction contracts, he decides to sell 3 contracts.

- b. Value of underlying asset when liquidated =  $(10,00,000 \times 108.14)/109.84 = \text{Rs.}9,84,522.9424$ .

$$\text{Gain on futures} = 3 \times 3800 \times (108.26 - 107.12) = \text{Rs.}12,996.$$

$$\text{Total value of hedged portfolio} = \text{Rs. } 9,84,522.9424 + \text{Rs.}12,996 = \text{Rs.}9,97,518.9424.$$

## Section C: Applied Theory

6. One of the primary factors driving bond portfolio managers towards indexing is the unimpressive performance of the active management strategies. Poor and inconsistent performance of the active bond portfolio managers in the past has turned the investors to index funds. In the past, returns earned by most active fund managers could match or outperform the market indices; their performance was not consistent over a period of time. Therefore, the investors naturally turned to index funds where they could obtain consistently higher long-term returns and reliable short-term performance.

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Another factor driving interest in index funds is the lower advisory fee schedule. Compared with active fund management, advisory fee schedule is very attractive for indexed funds. In the USA, advisory fees for index funds range between 30 and 70 percent of advisory fees for actively managed funds. This leads to substantial lower advisory fee schedule; transaction costs will also be lower for the index funds. This is because of lower turnover of assets and hence fewer transaction in the portfolio.

Another advantage of indexing is the degree of control exercised by the investor. Under active management, the investor has little control over the fund manager's investment decisions at any point of time. By indexing, the investor can specify the benchmark as well as the degree of latitude allowed to the index fund manager to deviate from the benchmark characteristics. For example, an active fund manager can change the duration of the portfolio to any extent depending on his interest rate forecast, but index fund manager may be constrained by, say, a maximum deviation of 10 per cent from the duration of the index. Thus, the investor can have a greater degree of control over investment under indexing strategy.

Indexing facilitates easier and better measurement of performance of the fund manager. Performance of a fund manager is measure by comparing the total return of the portfolio with the total return of the benchmark. Most widely used benchmarks are broad market indexes. Such comparison under active investment management has two serious shortcomings. The selected index may not be the appropriate benchmark for the fund manager. Secondly, deviations of portfolio characteristics from the benchmark characteristics, which explain the relative performance, are not thoroughly examined. These shortcomings can be overcome by indexing. Extensive search for the appropriate index must precede establishing the index fund, which ensures identification of an appropriate performance benchmark. Secondly, index fund investors can focus on the deviation of return of the portfolio from that of benchmarked index and require fund managers to attribute these deviations to specific benchmark characteristics.

Although indexing has many advantages over active management of portfolio, it has some disadvantages also. One of the main disadvantages of indexing is the loss of incremental returns, which could have been generated by investing in sectors with the highest performance. By not investing in better performing sectors and securities, the opportunity cost can be substantial. Different sectors and different types of securities like treasuries, corporate bond, mortgage-backed securities, etc., can generate incremental returns for the portfolio.

Another limitation of index funds is the rigid requirements associated with these funds. There may be attractive opportunities for investment outside the benchmark universe. If the fund manager is not allowed to invest in securities outside the universe of the benchmark index, then some attractive investment opportunities may be foregone.

7. **Advantages of using econometric Models**

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Following are the main advantages of using models:

Testing of hypothesis and idea of an economic indicator. Examples: Test to know how low interest rates stimulate growth and whether wages can be used as a predictor of inflation.

Estimating sensitivities. Example: Would one percentage point rise in the US Consumer Price Index typically translate into 1 a-year bond yield?

Developing internally consistent forecasts. Example: When researchers are using a judgmental approach, they may fail to see that something they are implying about income growth does not jibe with their assumption on employment growth.

Running simulation of complex scenario. Example: A government economist may need to find out what happens if interest rates and government spending are both cut.

### Problems in the Use of Models

The main problem in using the models is the lack of consistency of the data. Investment professionals should be

aware of this before any decision is taken based on these models. Other problems that arise in these models are:

*Implausible Result:* A number of variables used to isolate one may cause an implausible result. If any of the variables among them is working then the prediction might be quite unreliable.

*Statistical VS. Real World:* The other problem is the difference in the statistical result and the result in the real world.

*Error in the Underlying Data:* Past data used may be good predictors of some variable but in certain cases where variables are subject to huge revision they create problems when using models.

*Assumption:* Assumption is the most vital problem in using models. It is not possible to predict every variable, so every model has some assumptions. So it is suggested to be careful while using assumptions.

*Structural Changes:* Most of the models assume that past relationships have some, validity in predicting future relationships but this prediction may not be significant where fundamental structure changes due to rapidly changing economies.

*Simultaneity:* Simultaneity is the term used to measure the influence of one variable on another when that second variable also influences the first one. These occurrences can create confusion in using statistical models.

*Time Series Data:* The time series data i.e., the data that frequently changes due to some economic factors like population growth, GDP growth sometimes- have a number of problems. These data may violate some assumptions due to their, trend properties.

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