

Question Paper

Portfolio Management and Mutual Funds - I (MSF2D3) : April 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 assumptions is common between CAPM and APT?

[<Answer>](#)

- (a) There is a single period investment horizon
- (b) The investors can freely borrow and lend at risk-free rate
- (c) The investors select portfolios based on expected mean and variance of return
- (d) There are no taxes
- (e) Investors have homogeneous expectations and are expected-utility-of-wealth maximizers.

2. Strip strategy used under portfolio management involves

[<Answer>](#)

- (a) Buying a put option and a call option on the same underlying stock, each of which has the same exercise price and same expiration date
- (b) Buying a call option as well as selling call option on the same underlying stock, each of which has the same exercise price but different expiration dates
- (c) Buying a put option and a call option on the same underlying stock, each of which has the same expiration date but different exercise prices
- (d) Buying one call option as well as two put options on the same underlying stock with the same exercise price and the same expiration date
- (e) Buying two calls options as well as one put option on the same underlying stock with the same exercise price and expiration date.

3. Betas of two stocks are 0.64 and 1.08 respectively. If the standard deviation of the market returns is 12.47%, the covariance between the returns of two stocks is

[<Answer>](#)

- (a) 85.20(%)²
- (b) 107.48(%)²
- (c) 148.20(%)²
- (d) 188.76(%)²
- (e) 195.60(%)².

4. If coefficient of correlation between the returns of a portfolio and the market is 1, the portfolio's

[<Answer>](#)

- I. Return from net selectivity will be zero.
- II. Return from net selectivity will be equal to its return from total selectivity.
- III. Unsystematic risk will be zero.
- IV. Return from net selectivity will be equal to the return from inadequate diversification.

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

5. Nifty futures with an expiry date of May 29, 2008 are presently quoted at Rs.5100. The multiple of each contract is 50. The daily volatility in the futures price is 3.86%. The initial margin calculated by VAR at 99% confidence level will be

[<Answer>](#)

- (a) Rs.15,655
- (b) Rs.22,500
- (c) Rs.29,529
- (d) Rs.31,965
- (e) Rs.33,286.

6. The following is the information pertaining to an open ended mutual fund scheme:

[<Answer>](#)

	Rs. in million
Liabilities	56.2
Receivables	18.8
Accrued income	6.3
Other current assets	75.6
Value of investments	280.0
Accrued expenses	12.3

If the number of units outstanding is 21.4 million and the fund charges 2% as entry load, the public offer price will be approximately

- (a) Rs.12.45
- (b) Rs.13.62
- (c) Rs.14.89
- (d) Rs.15.46
- (e) Rs.16.24.

7. Duration of a bond normally increases with an increase in

[<Answer>](#)

- I. Yield to maturity.
- II. Term to maturity.
- III. Coupon Rate.

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

8. The current price of stock of Idea Cellular is Rs.120 and it is expected that stock price after one year will be either Rs.148.8 or Rs.91.2. The risk free rate is 6%. The probability of price decrease using single period Binomial model is given by [<Answer>](#)
- 0.296
 - 0.318
 - 0.375
 - 0.525
 - 0.625.
9. Pure cash matching strategy of portfolio dedication can be easily implemented by [<Answer>](#)
- Using low coupon bonds
 - Using high-rated coupon bonds
 - Using high coupon bonds
 - Using government bonds with low coupon rate
 - Using zero coupon bonds.
10. If investment A is better than investment B and investment B is in turn better than investment C, the investor should prefer A to both B and C. Which of the following axioms of investor's behavior better suits the above statement? [<Answer>](#)
- Comparability
 - Transitivity
 - Independence
 - Certainty Equivalent
 - Plausibility.
11. In reality, the SML is a band instead of a thin line because of [<Answer>](#)
- The effect of taxes.
 - The information asymmetry.
 - The existence of transaction costs.
- Only (I) above
 - Only (III) above
 - Both (I) and (II) above
 - Both (II) and (III) above
 - All (I), (II) and (III) above.
12. A high ratio of net selectivity to total selectivity for a portfolio indicates [<Answer>](#)
- High risk appetite of investor
 - Risk neutral nature of investor
 - Superior stock selection skills
 - Low beta of the portfolio
 - High risk averse nature of investor.
13. Which of the following is **not** the portfolio strategy, where index futures can be used? [<Answer>](#)
- Laddering
 - Yield enhancement
 - Modification of portfolio risk

- (d) Futures as a substitute for indexing
- (e) Hedging.

14. A portfolio manager has tracking error of 3.4% and alpha value of 1.8%. The approximate number of years, he would need to sustain this performance to be 90% confident of its significance is

[<Answer>](#)

- (a) 7.69 years
- (b) 8.14 years
- (c) 8.62 years
- (d) 9.63 years
- (e) 10.64 years.

15. Which of the following is **false** with respect to leading indicator approach?

[<Answer>](#)

- (a) This approach is valuable in indicating the direction of changes in economic activity
- (b) This approach is based on movement of selected economic factors, which indicate the movement of economy
- (c) This method does not convey any information on the magnitude and duration of change
- (d) This approach uses flow of funds or liquidity data to forecast the changes in general economic scenario
- (e) Residential construction, corporate profits and change in general price level can be considered as leading indicators.

16. Which of the following is/are **false** with respect to Risk Attribute Model of Salomon Brothers?

[<Answer>](#)

- I. In this model for measuring economic growth, the monthly change in industrial production is used.
- II. The difference between the expected inflation and the actual inflation is taken to determine the inflation shock.
- III. The factor representing the stage of the business cycle is taken as the difference between the yield on top rated corporate bonds of a 2-year maturity and a 2-year treasury bonds.

- (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.

17. Which of the following is/are **true** with respect to alpha of a portfolio?

[<Answer>](#)

- I. Information ratio is the difference between the portfolio alpha and the residual risk.
- II. Alpha of the security determines its under/out performance in relation to the expected return.
- III. Ex-ante alpha is regarded as the forecast of residual return.

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

18. Consider the following information pertaining to the stocks of two companies:

[<Answer>](#)

Stock	Return (%)	Variance (%) ²	Weight in the portfolio
Reliance Energy	18	676	0.6
Reliance Capital	15	324	0.4

If the variance of the portfolio is $328.9(\%)^2$, the coefficient of correlation between the returns of two stocks is

- (a) – 0.10
- (b) – 0.15
- (c) + 0.10
- (d) + 0.15
- (e) + 0.20.

19. Which of the following is/are **not true** regarding trade motivation as explained by Jack Treynor?

[<Answer>](#)

- I. The value traders can use time according to their convenience.
- II. The value traders are more sensitive to time, compared to price.
- III. The information traders tend to be less sensitive to time.

- (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.

20. Duration of a bond portfolio is 5 years and its average YTM is 10.65%. If average YTM increases to 10.80%, the percentage change in the value of the portfolio is

[<Answer>](#)

- (a) – 0.23%
- (b) + 0.23%
- (c) – 0.68%
- (d) + 0.68%
- (e) + 1.05%.

21. Bond laddering involves buying bonds of different

[<Answer>](#)

- (a) Prices
- (b) Durations
- (c) Convexities
- (d) Coupons
- (e) Maturities.

22. Active portfolio management consists of

[<Answer>](#)

- I. Market timing.
- II. Indexing.
- III. Security Analysis.

- (a) Only (I) above

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

23. The critical variable in the determination of the success of the active portfolio is

[<Answer>](#)

- (a) Alpha
- (b) Beta
- (c) Gamma
- (d) Coefficient of Correlation
- (e) Coefficient of Determination.

24. Mr. Sudarshan, a speculator bought a straddle at a strike price of Rs.350 on the stock of Satyam Computers, which is trading at Rs.350. He paid a total premium of Rs.30. The break-even prices for the speculator are

[<Answer>](#)

- (a) Rs.280 and Rs.260
- (b) Rs.365 and Rs.335
- (c) Rs.380 and Rs.320
- (d) Rs.410 and Rs.390
- (e) Rs.420 and Rs.410.

25. An investment strategy designed to earn a minimum rate of return while allowing the investor to benefit substantially from the positive returns generated by an investment in a risky portfolio is called

[<Answer>](#)

- (a) Portfolio dedication
- (b) Portfolio insurance
- (c) Portfolio revision
- (d) Portfolio attribution
- (e) Portfolio construction.

26. An investor is planning to choose between 2 year and 3 year maturity bonds, with YTM's of 7% and 8% respectively. The annual coupon payment on both the bonds is 8%. If his investment horizon is one year and he strongly believes that the yield curve will be flat at 8% at the end of the year,

[<Answer>](#)

- I. He should invest in 3-year bond, since holding period return on bond is comparatively more at 8%.
- II. He should invest in 2-year bond, since holding period return on bond is comparatively more at 6.08%.
- III. He should not invest in any of the bonds, as yield curve is expected to be flat after one year.

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

27. Which of the following statements is **true** with respect to VAR?

[<Answer>](#)

- (a) Historic Simulation method of computing VAR is based on Modern Portfolio Theory
- (b) Variance/Covariance method of computing VAR involves the use of historical market data, and

- calculating the market value of the portfolio for each day over a specified period of time
- (c) Monte Carlo Simulation method of computing VAR is also termed as correlation method
- (d) VAR assumes that the risk exposures are affected by only one risk factor
- (e) Variance/Covariance method of computing VAR is used to generate a large number of market movements which is consistent with expected volatility and correlations.

28. Mr.Seth has constructed a portfolio, which has 325 unique covariance terms. The number of securities included in the portfolio is

[<Answer>](#)

- (a) 23
- (b) 24
- (c) 25
- (d) 26
- (e) 27.

29. The standard deviation of a portfolio of two stocks will be the weighted average of the standard deviation of the stocks, if the coefficient of correlation between the returns of two stocks is

[<Answer>](#)

- (a) 0
- (b) -1
- (c) +1
- (d) 0.5
- (e) -0.5.

30. Immunization is **not** strictly a passive strategy because

[<Answer>](#)

- (a) It requires choosing an asset portfolio that matches an index
- (b) There is likely to remain a slight gap between the duration of assets and liabilities in most portfolios
- (c) It requires frequent rebalancing as maturities and interest rates change
- (d) Durations of assets and liabilities fall at the same rate
- (e) It requires to buy and sell securities having the same duration with the passage of time.

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. Mr. Amit is planning to invest in the balanced portfolio of a pension fund to be effective from 1st April 2008, and to be managed by Mr. Leeladhar. Mr. Leeladhar is planning to invest 20% of his portfolio mandatorily in government securities and the remaining part of his portfolio in equity portfolio and corporate bonds. As on April 1st 2008, the pension fund is expected to have the following liabilities to be paid in different years.

(Rs.)

Year	Liabilities
1	12,00,000
2	15,00,000
3	18,00,000
4	20,00,000
5	22,00,000

From 6th year onwards, the pension fund has the liability of Rs.24,00,000 p.a. in perpetuity.

The cost of such liabilities in the market is expected to be 11.5% p.a.

Mr. Leeladhar is planning to rebalance his portfolio on April 1st of every year, to immunize the above liabilities. The worth of the portfolio on April 1st 2008 is expected to be Rs.250 cr, which will include the investment in the following instruments.

Instruments	Face Value of each security/ unit/bond (Rs.)
Equity Portfolio	10
7.9% CG 2011	1000
11.4% ICICI 2013	1000

All the bonds are to mature on March 31st of their respective maturity years.

On April 1st 2008, each unit of equity portfolio trades at Rs.80. From the past experience, the appreciation of 10% p.a has been observed in the price of units of equity portfolio. It has also been observed that expected dividend ratio on equity portfolio is 60%.

On April 1st 2008, the pattern of yield curve is expected to be as follows:

Years to maturity	1	2	3	4	5	6	7	8	9	10
Yield (%)	6.80	6.85	6.92	7.10	7.45	7.64	7.82	7.95	8.12	8.48

The yield curve is expected to remain the same even in future.

You are **required** to determine:

- a. The amount of investment to be made by Mr. Leeladhar in each of the instruments as on April 1st 2008.

(6 marks)

- b. The value of portfolio on April 1st 2009 before rebalancing and also show the amount of investment in each of the instruments after rebalancing.

(8 marks)

2. Consider the following information pertaining to three portfolios Alpha, Beta and Gamma:

[<Answer>](#)

Portfolio Alpha		Portfolio Beta		Portfolio Gamma	
Expected return (%)	Probability (%)	Expected return (%)	Probability (%)	Expected return (%)	Probability (%)
11	35	12	10	11	10
12	25	13	30	13	20
13	15	14	30	15	25
14	15	15	20	17	35
15	10	16	10	19	10

You are **required** to:

a. Determine which of the above portfolios is preferable, if the utility function is $u(w) = w - w^{-3/5}$ (where w is expected return).

(2 marks)

b. Determine which of the above portfolios is preferable according to Roy's Safety First criterion, if the minimum level of return required is 15%.

(1 mark)

c. Determine the preferred portfolio based on Kotaoka's Safety First criterion, if the probability of return being less than the minimum determined return should not be more than 30%.

(2 marks)

d. Determine which portfolio is preferred, using geometric mean return.

(2 marks)

e. Determine, which of the above portfolio is suitable for him if the risk tolerance level of a moderate risk-averse investor is 60%.

(2 marks)

3. Mr. Singhania has zeroed in on the following stocks with the parameters given below:

[<Answer>](#)

Stock	Return (%)	Beta	Residual Variance (%) ²
Aravind Pharama	16.01	0.98	10.25
Berger Paints	15.74	1.02	6.95
Century Textiles	20.325	1.35	10.75
Dena Bank	20.275	1.25	6.35
Escorts India	18.45	1.20	5.50

The return on T-Bills is 6.5% p.a. The variance of market returns is 30(%)². You are **required** to construct an optimum portfolio using the Sharpe's optimization method.

(8 marks)

4. Consider the following portfolios:

[<Answer>](#)

Portfolio	Appraisal Ratio	Beta	Alpha (%)
P	0.8	1.1	1.8
Q	0.6	0.6	1.1
R	1.2	1.8	2.4
S	1.5	2.1	1.9

Treynor's ratio and Sharpe ratio for market portfolio are 7.5 and 0.65 respectively. T-Bills are trading in the market at 7% p.a.

You are **required** to:

- | | | | |
|---|---|---|--------|
| a. Compute the return from all the portfolios. | (| 2 | marks) |
| b. Compute Treynors ratio for all the portfolios. | (| 2 | marks) |
| c. Compute Sharpe ratio for all the portfolios. | (| 4 | marks) |
| d. Compute the return due to net selectivity and the return due to extra diversifiable risk for all the portfolios. | (| 2 | marks) |

5. Mr. Agarwal invested in 20,000 shares of IDFC. Each share of IDFC is currently trading in the market at the price of Rs.185. Mr. Agarwal would like to defer selling the stock until July 2008. In July 2008, however he will need to sell all his holdings to provide for his son's education. In order to hedge the price risk involved, he is considering the following three strategies.

[<Answer>](#)

Strategy A: To write July 2008 call options on the stock of IDFC with a strike price of Rs.200 each. Each of these calls is currently selling at a premium of Rs.18.

Strategy B: To buy July 2008 put options on the stock of IDFC with a strike price of Rs.190 each. Each of these options is available at a premium of Rs.18.

Strategy C: To write July 2008 call options at a strike price of Rs.200 each and to buy July 2008 put options at a strike price of Rs.190 each. The premium is Rs.18 in each case.

For all the above strategies, you are **required** to show tables and diagrams for cash flows that occur in July 2008 and suggest the best strategy for Mr. Agarwal.

(9 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.

6. Arbitrage pricing theory has wide applications in corporate finance and investment management. Explain how it can be used for active and passive strategies.

[<Answer>](#)

(10 marks)

7. Credit risk in bond portfolio management is defined as the risk of the non-payment of principal and interest, downgrading and widening of credit swap. Credit derivative is one of the useful tools to diversify or acquire credit risk. Explain various credit derivatives generally used in fixed income portfolio management.

[<Answer>](#)

(10 marks)

END OF SECTION C

END OF QUESTION PAPER

Suggested Answers

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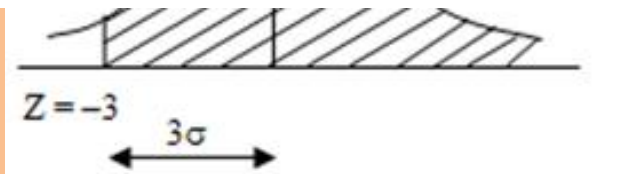
Section A : Basic Concepts

Answer

Reason

- | | | | |
|----|---|---|-------------------------------|
| 1. | e | Assumptions mentioned under (a), (b), (c) and (d) are the assumptions specific to CAPM, which APT does not assume. | < TOP > |
| 2. | d | Alternative (a) is straddle strategy. Alternative (b) pertains to horizontal spread strategy. Alternative (c) is used under strangle strategy whereas strategy (d) is used under strip strategy. The strategy under (e) pertains to strap. | < TOP > |
| 3. | b | According to the single index model
$\text{Cov}(R_p R_q) = \beta_p \beta_q \sigma_m^2$ $= 0.64 \times 1.08 \times (12.47)^2$ $= 107.48(\%)^2$ | < TOP > |
| 4. | b | If the coefficient of correlation of a portfolio with market index is 1 then its unsystematic risk is zero as unsystematic risk =

If unsystematic is Zero, then return due to total selectivity would be equal to its net selectivity and return from in adequate diversification is 0. Hence (II) and (III) are correct. Hence (b) is the answer. | < TOP > |
| 5. | C |  | < TOP > |



Hence, VAR at 99% confidence level = 3σ

$$= 3 \times 3.86 = 11.58\%$$

$$\text{and in Rupee terms VAR} = 5100 \times 50 \times \\ = \text{Rs.29529.}$$

Therefore, the initial margin required = Rs. 29529.

6. C NAV of the fund unit =
 = 14.59
 The public offer price (POP) = 14.8865 i.e., 14.89 [< TOP >](#)
7. b Duration and YTM as well as Duration and Coupon rate are inversely related. Any increase in YTM decreases duration. Similarly, an increase in coupon rate results in decrease of bond duration. [< TOP >](#)
8. c Probability of price rise in Binomial Model is given by
 $P =$
 $R = 1.06$
 $u = 148.8/120 = 1.24$
 $d = 0.76$
 $P = 0.625$
 The probability of price decrease is $= 1 - 0.625 = 0.375$ [< TOP >](#)
9. e Pure cash matching strategy of portfolio dedication can be implemented very easily by using zero coupon bonds because balancing of coupon with liabilities doesn't arise and only fixed value of zero coupon bond at different point of time with respective liability should be achieved [< TOP >](#)
10. b Given two investments, the investor should be able to state his preference to one of them or his indifference to both of them. This is called comparability. Hence, alternative (a) is not answer.
 If investment A is better than investment B and investment B is in turn better than C, the investor should prefer A to both B and C. This is called transitivity (b). Hence, alternative (b) is answer.
 If there are three investments – X, Y and Z, which provide return x, y and z respectively and an investor is indifferent between X and Y, according to this axiom of independence (c), the investor should be indifferent between the following two combinations:
 - A return of x with a probability p and a return of z with a probability (1-p)
 - A return of y with a probability p and a return of z with a probability (1-p).
 That is, the investor may choose both or reject both- he should be indifferent between the two.
 According to the axiom of Certainty Equivalent (d), for every uncertain investment outcome (a 'gamble'), there is a certain

value of outcome (which does not carry uncertainty), which makes the investor feel indifferent between uncertain outcome and certain outcome. Plausibility (e) means understandability, which is no way related with the present case.

11. e Stocks plotting off the security market line provide the evidence of mispricing in the market. In reality there is always bound to be some mispricing because of presence of transaction cost, taxes and information asymmetry. Therefore, in practice, the SML is a band instead of a thin line. [< TOP >](#)

12. c A high ratio of net selectivity to total selectivity for a portfolio indicates that the return required for inadequate diversification is less. This indicates superior stock selection skills. [< TOP >](#)

13. a Fund managers can use index futures in the following five portfolio strategies. [< TOP >](#)

- Asset allocation
- Yield enhancement
- Modification of portfolio risk
- Futures as a substitute for indexing
- Hedging.

Hence, laddering (a) is not a strategy, where index futures can be used.

14. D Information ratio = Alpha / Tracking error = $1.8/3.4 = 0.52941 \sim 0.53$ [< TOP >](#)
 The number of years of the sustained performance = $(\text{Confidence level}/\text{Information ratio})^2$
 As the level of significance is 90%, 1.645 is the confidence level
 $(1.645/0.53)^2 = 9.6334 \sim 9.63$ years.

15. d Liquidity /Flow of funds approach technique uses flow of funds or liquidity data to forecast the changes in general economic scenario. All other alternatives are the properties of leading indicator approach. Hence (d) is the answer. [< TOP >](#)

16. b The factor representing the stage of the business cycle is taken as the difference between the yield for top rated corporate bonds of a 20-year maturity and the 20-year treasury bonds. All other options are said to be correct. Hence option (b) is said to be the correct answer. [< TOP >](#)

17. E Alpha of security determines its under/out performance in relation to the expected return. The ratio of alpha to residual risk incurred should be maximized to enhance the confidence in the performance measurement system. The information ratio is calculated as portfolio alpha/residual risk. On the other hand the ex-ante alpha is regarded as the forecasts of residual return whereas ex-post alpha is the average of the realized residual return. Hence option (e) is said to be the answer. [< TOP >](#)

18. D Variance of the portfolio of two stocks is calculated as [< TOP >](#)

$$\sigma_1^2 w_1^2 + \sigma_2^2 w_2^2 + 2\sigma_1\sigma_2 w_1w_2, \text{ where}$$

σ_i is variance of the stock

w_i is weight of the stock

ρ is the correlation coefficient of two stocks,

In the given case,

$$676 \times 0.6^2 + 324 \times 0.4^2 + 2 \times 26 \times 18 \times 0.6 \times 0.4 \times \rho = 328.9$$

= 0.15.

19. E According to Jack Treynor, key motives for trading are value, informatin and cash flow. The value traders can use time according to their conveniece so that by extending the time of trading, they can reduce the cost of trading., Information traders tend to be more sensitive to time. [< TOP >](#)
20. C Change in YTM = $10.8 - 10.65 = 0.15\%$
Change in price of the bond = $= -0.68\%$. [< TOP >](#)
21. e Bond laddering involves buying bonds of different maturities. [< TOP >](#)
22. d Active portfolio management consists of only market timing and security analysis. Indexing is a strategy of passive management. [< TOP >](#)
23. a The critical success factor in determining the success of a portfolio is Alpha. Hence, alternative (a) is answer. [< TOP >](#)
24. C Straddle strategy involves buying a call option and a put option at the same exercise price and maturity. Higher break even price = Rs.350 + Rs.30 = Rs.380. Lower break even price = Rs.350 – Rs.30 = Rs.320. [< TOP >](#)
25. b An investment strategy designed to earn a minimum rate of return while allowing the investor to benefit substantially from the positive returns generated by an investment in a risky portfolio is portfolio insurance. [< TOP >](#)
26. A The investor is planning to choose between 2 year and 3 year maturity bonds which yield 7% and 8% respectively. The annual coupon payment on both the bonds is 8%. If you strongly believe that at year end, the yield curve will be flat at 8%,
Let the face of value of the bonds be Rs.1000
Current price of two year bond = $80 \text{ PVIFA } (7\%, 2) + 1000 \text{ PVIF } (7\%, 2) = \text{Rs.}1018.08$
Current price of three year bond = Rs.1000 as its YTM is equal to coupon rate
Price of two year bond after 1 year Rs.1000 as its YTM is equal to coupon rate
Price of three year bond after 1 year Rs.1000 as its YTM is equal to coupon rate
Return on two year bond = $[(1000 - 1018.08) + 80] / 1018.08 = 61.92 / 1018.08 = 6.08\%$
Return on three year bond = $[(1000 - 1000) + 80] / 1000 = 8\%$ [< TOP >](#)
27. d Variance/Covariance method is based on Modern Portfolio Theory. [< TOP >](#)
Historic Simulation method involves the use of historical market data, and calculating the market value of the portfolio for each day over a specified period of time.
Variance/Covariance method is also termed as correlation method.
VAR assumes that the risk exposures are affected by only one risk factor.
Historic Simulation method is used to generate a large number of market movements which is consistent with expected volatility and correlations.
28. D Number of unique covariances = $n(n-1) / 2 = n(n-1) / 2 = 325$ [< TOP >](#)
 $= n^2 - n - 650$
 $n = 26$
29. c If coefficient of correlation between two stock's return A and B is +1 and W_A and W_B is the amount invested in a portfolio of [< TOP >](#)

these two stocks. Portfolio risk will be
Hence answer is (c).

30. C Immunization is an approach where the bond manager matches the duration of portfolio with the current investment horizon to get the promised yield and neutralize the effect of interest rate change. However, the immunized portfolio requires periodic rebalancing because of ever changing duration of the bond portfolio as well as the yield which is in contravention of the assumption under immunization.

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Section B : Problems

1. a. Duration of bonds and equity:

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Duration of 7.9% CG 2011

Year	Cash flows	Present value of cash inflows at 6.92%	Weighted present value of cash inflows
1	79	73.89	73.89
2	79	69.105	138.21
3	1079	882.76	2648.28
		1025.755	2860.38
Duration			2.79 years

Duration of 11.4% ICICI 2013

Year	Cash flows	Present value of cash inflows at 7.45%	Weighted present value of cash inflows
1	114	106.1	106.1
2	114	98.74	197.48
3	114	91.89	275.67
4	114	85.52	342.08
5	1114	777.77	3888.85
		1160.02	4810.18
Duration			4.15 years

Dividend yield = Dividend/Market price = 6/80 = 7.5

Duration of equity = 1/Dividend Yield = 1/0.075 = 13.33 years

Duration of liabilities:

Years	Liabilities	Terminal value	@ 11.5%	Present value of cash inflows	Weighted present value of cash inflows
1	12,00,000		0.897	10,76,400	10,76,400

2	15,00,000		0.804	12,06,000	24,12,000
3	18,00,000		0.721	12,97,800	38,93,400
4	20,00,000		0.647	12,94,000	51,76,000
5	(22,00,000 +2,08,69,565*)		0.580	1,33,80,347.7	6,69,01,738.5
				18254547.7	7,94,59,538.5
				Duration	4.35 3 years

Terminal value for liabilities from 6th year onwards = $24,00,000/0.115 = 2,08,69,565^*$

Computation of proportions of investment to be made in each of the instruments to immunize the liability:

Let the investment to be made in 11.4% ICICI 2013 corporate bond be x.

$$2.79 \times 0.20 + 4.15x + (0.8 - x) \times 13.33 = 4.353 \text{ years}$$

$$0.558 + 4.15x + 10.664 - 13.33x = 4.353$$

$$6.869 = 9.18x$$

$$x = 0.748$$

Proportion of investment in 7.9% 2011 CG = 0.2

Proportion of investment in 11.4% 2013 ICICI = 0.748

Proportion of investment in Equity portfolio = $1 - 0.748 - 0.2 = 0.052$

Investment in 7.9% 2011 CG bonds = $0.20 \times \text{Rs.}250 \text{ cr} = \text{Rs.}50 \text{ crore}$

Investment in 11.4% 2013 ICICI bonds = $0.748 \times \text{Rs.}250 \text{ cr} = \text{Rs.}187 \text{ crore}$

Investment in Equity portfolio = $0.052 \times \text{Rs.}250 \text{ cr} = \text{Rs.}13 \text{ crore}$

Number of 7.9% 2011 CG bonds = $\text{Rs.}50 \text{ crore} / \text{Rs.}1025.755 = 4,87,445.83 \sim 4,87,446$

Number of 11.4% 2013 ICICI bonds = $\text{Rs.}187 \text{ crore} / \text{Rs.}1160.02 = 16,12,041.172 \sim 16,12,041$

Number of units of equity portfolio = $\text{Rs.}13 \text{ crore} / \text{Rs.}80 = 16,25,000$

b. Duration of bonds after one year:

Duration of 7.9% CG 2011

Year	Cash flows	Present value of cash inflows at 6.85%	Weighted present value of cash inflows
1	79	73.94	73.94
2	1079	945.09	1890.18
		1019.03	1964.12
Duration			1.93 years

Duration of 11.4% ICICI 2013

Year	Cash flows	Present value of cash inflows at 7.1%	Weighted present value of cash inflows
------	------------	---------------------------------------	--

1	114	106.44	106.44
2	114	99.39	198.78
3	114	92.80	278.40
4	1114	846.70	3386.80
		1145.33	3970.42
Duration			3.47 years

The value of portfolio before rebalancing:

$$4,87,446 \times 1019.03 + 16,12,041 \times 1145.33 + 16,25,000 \times 88 = \text{Rs.} 2,48,60,41,016$$

Duration of liabilities after one year:

Year	Liabilities	Terminal value	PVIF @ 11.5%	Present value of cash flows	Weighted present value of cash flows
1	15,00,000		0.897	13,45,500	13,45,500
2	18,00,000		0.804	14,47,200	28,94,400
3	20,00,000		0.721	14,42,000	43,26,000
4	(22,00,000 +2,08,69,565*)		0.647	1,49,26,009	5,97,04,036
				1,91,60,709	6,82,69,936
				Duration	3.563 years

Terminal value for liabilities from 5th year onwards = $24,00,000 / 0.115 = 2,08,69,565^*$

Dividend yield = Dividend/Market price = $6/88 = 6.82\%$

Duration of equity = $1/\text{Dividend Yield} = 1/0.0682 = 14.66$ years

Computation of proportions of investment to be made in each of the instruments after a year to immunize the liability:

Let the investment to be made in 11.4% ICICI 2013 corporate bond be x.

$$1.93 \times 0.20 + 3.47x + (0.8-x) \times 14.66 = 3.563 \text{ years}$$

$$0.386 + 3.47x + 11.728 - 14.66x = 3.563$$

$$8.551 = 11.19x$$

$$x = 0.7642$$

Proportion of investment in 7.9% 2011 CG = 0.2

Proportion of investment in 11.4% 2013 ICICI = 0.7642

Proportion of investment in Equity portfolio = $1 - 0.7642 - 0.2 = 0.0358$

Investment in 7.9% 2011 CG bonds = $0.20 \times \text{Rs. } 2,48,60,41,016 = \text{Rs. } 49,72,08,203$

Investment in 11.4% 2013 ICICI bonds = $0.7642 \times \text{Rs. } 2,48,60,41,016 = \text{Rs. } 1,89,98,32,544$

Investment in Equity portfolio = $0.0358 \times \text{Rs. } 2,48,60,41,016 = \text{Rs. } 8,90,00,268$

2. a. $u(w) =$

Outcome (%)	Utility	Outcome (%)	Utility	Outcome (%)	Utility
11	10.76	12	11.77	11	10.76
12	11.77	13	12.79	13	12.79
13	12.79	14	13.79	15	14.80
14	13.79	15	14.80	17	16.82
15	14.80	16	15.81	19	18.83

The expected utility of each of the above investment is investment utility.

$$\begin{aligned}\text{Alpha} &= 10.76 \times 0.35 + 11.77 \times 0.25 + 12.79 \times 0.15 + 13.79 \times 0.15 + 14.8 \times 0.10 \\ &= 12.1755\%\end{aligned}$$

$$\begin{aligned}\text{Beta} &= 11.77 \times 0.1 + 12.79 \times 0.3 + 13.79 \times 0.3 + 14.8 \times 0.2 + 15.81 \times 0.1 \\ &= 13.692\%\end{aligned}$$

$$\begin{aligned}\text{Gamma} &= 10.76 \times 0.10 + 12.79 \times 0.20 + 14.8 \times 0.25 + 16.82 \times 0.35 + 18.83 \times 0.10 \\ &= 15.104\%\end{aligned}$$

As the expected utility of investment Gamma is higher, it is **preferable**.

b. Probability of getting a return less than 15% from each of investment alternative can be calculated as follows:

$$\text{Alpha} = 0.35 + 0.25 + 0.15 + 0.15 = 0.90$$

$$\text{Beta} = 0.10 + 0.30 + 0.30 = 0.70$$

$$\text{Gamma} = 0.1 + 0.20 = 0.30$$

As the probability of getting return less than 15% is lowest for investment Gamma, it is **preferable** based on Roy's first safety criterion.

c. The probability of getting a return less than each alternative return can be calculated as follows:

Minimum return	Probability of getting less than minimum		
	Alpha	Beta	Gamma
11	0	0	0
12	35%	0	10%
13	60%	10%	10%
14	75%	40%	10%
15	90%	70%	30%

According to Kataoka's safety first criterion, the lowest possible return should be maximized without exceeding the given probability.

From the above table it is very much evident that the investment Gamma has given a maximum return of 15% at which probability of getting a return lesser than 15% is just 30%. Therefore, investment Gamma is **preferable**.

d. The geometric mean return of the three portfolios can be calculated as follows:

$$\begin{aligned}\text{A} &= [(1.11)^{0.35} \times (1.12)^{0.25} \times (1.13)^{0.15} \times (1.14)^{0.15} \times (1.15)^{0.10}] - 1 \\ &= 12.39\%\end{aligned}$$

$$\begin{aligned}\text{B} &= [(1.12)^{0.10} \times (1.13)^{0.30} \times (1.14)^{0.30} \times (1.15)^{0.20} \times (1.16)^{0.10}] - 1 \\ &= 13.89\%\end{aligned}$$

$$C = [(1.11)^{0.10} \times (1.13)^{0.20} \times (1.15)^{0.25} \times (1.17)^{0.35} \times (1.19)^{0.10}] - 1$$

$$= 15.28\%$$

Investment Gamma is **preferable** as the geometric mean return is highest.

- e. We have to calculate the expected utility of these investments for investor.

$$\text{Expected utility} = \text{Return} -$$

Investment Alpha

$$\text{Expected return} = 11 \times 0.35 + 12 \times 0.25 + 13 \times 0.15 + 14 \times 0.15 + 15 \times 0.10 = 12.4\%$$

$$\text{Variance of returns} = [(11 - 12.4)^2 \times 0.35 + (12 - 12.4)^2 \times 0.25 + (13 - 12.4)^2 \times 0.15 + (14 - 12.4)^2 \times 0.15 + (15 - 12.4)^2 \times 0.10] = 1.84(\%)^2$$

$$\text{Expected utility} = 12.4 - \frac{1.84}{2} = 12.37\%$$

Investment Beta

$$\text{Expected return} = 12 \times 0.10 + 13 \times 0.30 + 14 \times 0.30 + 15 \times 0.20 + 16 \times 0.10 = 13.9\%$$

$$\text{Variance of returns} = [(12 - 13.9)^2 \times 0.10 + (13 - 13.9)^2 \times 0.30 + (14 - 13.9)^2 \times 0.30 + (15 - 13.9)^2 \times 0.20 + (16 - 13.9)^2 \times 0.10]$$

$$= 1.29(\%)^2$$

$$\text{Expected utility} = 13.9 - \frac{1.29}{2} = 13.8785\%$$

Investment Gamma

$$\text{Expected return} = 11 \times 0.10 + 13 \times 0.20 + 15 \times 0.25 + 17 \times 0.35 + 19 \times 0.10 = 15.3\%$$

$$\text{Variance of returns} = [(11 - 15.3)^2 \times 0.10 + (13 - 15.3)^2 \times 0.20 + (15 - 15.3)^2 \times 0.25 + (17 - 15.3)^2 \times 0.35 + (19 - 15.3)^2 \times 0.10]$$

$$= 5.31\%$$

$$\text{Expected utility} = 15.3 - \frac{5.31}{2} = 15.2115\%$$

As the expected utility for investment Gamma is highest, it should be suitable to the moderately risk averse investor.

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Stock	a_i	b_i	R_i	$R_i - R_f$	$(R_i - R_f) / b_i$	Rank
Aravind Pharama	1.80	0.98	16.01	10.25	9.51	4
Berger Paints	0.95	1.02	15.74	6.95	9.24	5
Century Textiles	0.75	1.35	20.325	10.75	13.825	2
Dena Bank	2.15	1.25	20.275	6.35	13.775	1
Escorts India	1.05	1.20	18.45	5.50	11.95	3

Rank	Stock	s^2_{ei}	b_i	$R_i - R_f$	$(R_i - R_f) \wedge b_i$	$(R_i - R_f) b_i / s^2_{ei}$
1.	Dena Bank	6.35	1.25	13.775	17.21875	2.7116
2	Century Textiles	10.75	1.35	13.825	18.66375	1.7362
3	Escorts India	5.50	1.20	11.95	14.34	2.6073
4	Aravind Pharama	10.25	0.98	9.51	9.3198	0.9093

5	Berger Paints	6.95	1.02	9.24	9.4248	1.3561
Stock			S	S		
Dena Bank	2.7116	0.2461	2.7116	0.2461		9.7039
Century Textiles	1.7362	0.1695	4.4478	0.4156		9.9075
Escorts India	2.6073	0.2618	7.0551	0.6774		9.9265
Aravind Pharama	0.9093	0.0937	7.9644	0.7711		9.9006
Berger Paints	1.3561	0.1497	9.3205	0.9208		9.7686

$$C^* = 9.9265$$

$$Z_i =$$

$$Z_D = 0.2153$$

$$Z_C = 0.0394$$

$$Z_E = 0.007$$

$$Z_i = 0.2153 + 0.0394 + 0.007 = 0.2617$$

$$\%D = 0.8227 \text{ i.e. } 82.27\%$$

$$\%C = 0.1506 \text{ i.e., } 15.06\%$$

$$\%E = 0.026748 \text{ i.e., } 2.67\%$$

4. a. Treynor's ratio for market portfolio = $(R_M - R_F) / \beta_M$

As β_M of market portfolio is 1

Market Risk Premium $(R_M - R_F) = 7.5\%$

Total Return = Alpha + R_f + Beta $(R_m - R_f)$

Portfolio P = $1.8 + 7 + 1.1 \times 7.5 = 17.05\%$

Portfolio Q = $1.1 + 7 + 0.6 \times 7.5 = 12.6\%$

Portfolio R = $2.4 + 7 + 1.8 \times 7.5 = 22.9\%$

Portfolio S = $1.9 + 7 + 2.1 \times 7.5 = 24.65\%$

- b. Treynor Ratio = $(R_P - R_F) / \beta_P$

Portfolio P = $(17.05 - 7) / 1.1 = 9.14$

Portfolio Q = $(12.6 - 7) / 0.6 = 9.33$

Portfolio R = $(22.9 - 7) / 1.8 = 8.83$

Portfolio S = $(24.65 - 7) / 2.1 = 8.40$

- c. Appraisal ratio = Alpha/Residual Risk

Residual risk = Alpha/Appraisal ratio

Portfolio P = $1.8 / 0.8 = 2.25\%$

Portfolio Q = $1.1 / 0.6 = 1.83\%$

Portfolio R = $2.4 / 1.2 = 2\%$

Portfolio S = $1.9 / 1.5 = 1.27\%$

Residual risk²

Portfolio P = $5.0625(\%)^2$

Portfolio Q = $3.3489(\%)^2$

Portfolio R = $4(\%)^2$

Portfolio S = $1.6129(\%)^2$

Sharpe's ratio of market portfolio = $(R_M - R_F) / \sigma_M = 0.65$

$\sigma_M = 7.5 / 0.65 = 11.54\%$

Systematic risk = $\text{Beta}^2 \times \sigma_M^2$

Portfolio P = $1.1^2 \times 11.54^2 = 161.14(\%)^2$

Portfolio Q = $0.6^2 \times 11.54^2 = 47.94(\%)^2$

Portfolio R = $1.8^2 \times 11.54^2 = 431.48(\%)^2$

Portfolio S = $2.1^2 \times 11.54^2 = 587.29(\%)^2$

Total risk = Residual Risk + Systematic risk

$$\text{Portfolio P} = 5.0625 + 161.14 = 166.2025 (\%)^2 \quad \text{S.D} = 12.89(\%)$$

$$\text{Portfolio Q} = 3.3489 + 47.94 = 51.2889 (\%)^2 \quad \text{S.D} = 7.16(\%)$$

$$\text{Portfolio R} = 4 + 431.48 = 435.48 (\%)^2 \quad \text{S.D} = 20.87(\%)$$

$$\text{Portfolio S} = 1.6129 + 587.29 = 588.9029 (\%)^2 \quad \text{S.D} = 24.27(\%)$$

$$\text{Sharpe Ratio} = (R_P - R_F) / \sigma_P$$

$$\text{Portfolio P} = (17.05 - 7) / 12.89 = 0.7797\%$$

$$\text{Portfolio Q} = (12.6 - 7) / 7.16 = 0.7821\%$$

$$\text{Portfolio R} = (22.9 - 7) / 20.87 = 0.7619\%$$

$$\text{Portfolio S} = (24.65 - 7) / 24.27 = 0.7272\%$$

d. $\text{Return due to net selectivity} = R_P - [R_F + (R_M - R_F) \sigma_P / \sigma_M]$

$$\text{Portfolio A} = 17.05 - [7 + (7.5)12.89/11.54] = 1.67\%$$

$$\text{Portfolio B} = 12.6 - [7 + (7.5)7.16/11.54] = 0.9466\%$$

$$\text{Portfolio C} = 22.9 - [7 + (7.5)20.87/11.54] = 2.34\%$$

$$\text{Portfolio D} = 24.65 - [7 + (7.5)24.27/11.54] = 1.87\%$$

Return due to extra diversifiable risk = Return from total selectivity – Return from net selectivity

$$\text{Portfolio A} = 1.8 - 1.67 = 0.13\%$$

$$\text{Portfolio B} = 1.1 - 0.9466 = 0.1534\%$$

$$\text{Portfolio C} = 2.4 - 2.34 = 0.06\%$$

$$\text{Portfolio D} = 1.9 - 1.88 = 0.02\%$$

5. a. By writing covered call options, Mr. Agarwal takes in premium income of Rs.3,60,000. If the price of the stock in July is less than or equal to Rs.200, he will have his stock plus the premium income. But the most he can have is Rs.(40,00,000 + 3,60,000) because the stock will be called away from him if its price exceeds Rs.200.

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This strategy offers some extra premium income but leaves substantial downside risk. At an extreme, if the stock price fell to zero, Mr. Agarwal would be left with only Rs.3,60,000. The strategy also puts a cap on the final value at Rs.43,60,000.

Writing a call:

Spot Price (Rs.)	Inflow on selling Underlying Stock (Rs.)	Loss on Short Call @200 (Rs.)	Premium Inflow (Rs.)	Net Flow (Rs.)
0	0		18	18
140	140		18	158
150	150		18	168
160	160		18	178

170	170		18	188
180	180		18	198
190	190		18	208
200	200		18	218
210	210	-10	18	218
220	220	-20	18	218
230	230	-30	18	218
240	240	-40	18	218
250	250	-50	18	218

b. By buying put options with Rs.190 exercise price, Mr. Agarwal will be paying Rs.3,60,000 in premiums to ensure a minimum level for the final values of his position. That minimum value is $190 \times 20,000 - 3,60,000 = \text{Rs.}34,40,000$. This strategy allows for upside gain, but exposes Mr. Agarwal to the possibility of a moderate loss equal to the cost of the puts.

Buying a put:

Spot Price (Rs.)	Inflow on selling Stock (Rs.)	Gain on Long Put @190 (Rs.)	Premium Outflow (Rs.)	Net Flow (Rs.)
0	0	190	-18	172
140	140	50	-18	172
150	150	40	-18	172
160	160	30	-18	172
170	170	20	-18	172
180	180	10	-18	172
190	190		-18	172
200	200		-18	182
210	210		-18	192
220	220		-18	202
230	230		-18	212

240	240		-18	222
250	250		-18	232

c. The net cost is zero. If the stock price is less than or equal to Rs.190, it preserves Rs.,38,00,000 in principal. If the price exceeds Rs.200, the value of Mr.Agarwal portfolio can rise to a cap of Rs.40,00,000. In between, his proceeds equal 20,000 times the stock price.

The best strategy obviously is C since it satisfies the two requirements of preserving the Rs.38,00,000 in principal while offering a chance of getting Rs.40,00,000.

Writing a call and buying a put:

Premium inflow = Rs.18

Premium outflow = Rs.18

Net initial flow = 0

Spot Price (Rs.)	Inflow on selling Stock (Rs.)	Loss on Short Call @200 (Rs.)	Gain on Long Put @190 (Rs.)	Net Flow (Rs.)
0	0		190	190
140	140		50	190
150	150		40	190
160	160		30	190
170	170		20	190
180	180		10	190
190	190			190
195	195			195
200	200			200
210	210	-10		200
220	220	-20		200
230	230	-30		200
240	240	-40		200

250	250	-50	200
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The best strategy obviously is C since it satisfies the two requirements of minimizing the loss with zero initial investment.

Section C: Applied Theory

6. APT and Active Management

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- i. One of the important uses of multi-index model in active management of portfolios is making factor bets. If one's expectations are against the market expectations with respect to some factor, one can take a position so as to benefit by one's expectations. Suppose inflation expected by the market is 6 percent but you believe it to be 8 percent. By increasing your exposure to stocks/portfolios whose returns are positively related with inflation. One can increase your returns. By increasing the number of factors in the model, betting opportunities can be increased.
- ii. Another application of APT is in identifying mispriced securities. This is similar to the CAPM model. APT is used to estimate the required return on a stock based on the various return generating factors and sensitivity of the security to these factors. Along with the required rate of return, expected return on the stock is also estimated. If the required return is greater than the expected return, the security is overpriced and one can go short on the stock. On the other hand, if the required return is less than the expected return the security is underpriced and one can go long on this stock. This way APT can be used to identify the mispriced securities and adopt a suitable strategy. The advantage of APT over CAPM is that the required return can be more accurately estimated with the APT model. This is because, two securities having same sensitivity to the market index (beta) might have different sensitivities to other factors, which are important in determining the equilibrium return.
- iii. Finally, multi-index model can be used in long-short investment strategy or risk neutral investment strategy. This is nothing but the arbitrage mechanism illustrated above. If you are able to correctly identify underpriced and overpriced assets using the APT you can construct zero risk, zero investment portfolios with a positive net return.

APT and Passive Management

- i. Index fund is a widely used strategy of passive management of a portfolio. Under this strategy, a portfolio of stocks is created such that performance of this portfolio closely reflects the performance of the underlying index. Such a portfolio can be created using the single-index

model by finding a portfolio that has a beta of one with the index and that has minimum residual variance (risk) for a given portfolio size.

Using a multi-index model rather than a single index model in construction of the index portfolio can help in better tracking the performance of the index. This is because there can be more than one source of return generation. By using multi-index model the portfolio can be matched with the index in terms of all important sources of return movements. That is, the correlation between the returns on the portfolio and the index can be improved, thereby capturing the performance of the index through our portfolio. If the source of return is only one factor, market factor, then multi-index model is to better than the single index model. But it is safe to assume that returns are generated by more than one factor.

ii. Another application where APT comes handy is construction of index-portfolios where some of the stocks in the index are deliberately kept out. Suppose, as a matter of policy a fund manager would like to avoid exposure to some sectors. If single index is used to construct the portfolio, sensitivity of the portfolio to other important factors may be missed and multi-index model can improve tracking an index. Same is the case when a fund manager, as a matter of policy, must include certain stocks in the portfolio.

iii. Some times it may be desired by the fund manager to track the performance of the index and take position with respect to some additional risks, which are not captured in the index. This objective can be achieved only through a multi-index model. Take the case of a pension fund whose cash outflows are indexed to inflation. If inflation increases, cash outflow also increases. Manager of such a fund would like to have cash flows positively related to inflation. He might wish to hold a portfolio that has a zero or preferably positive sensitivity to inflation. He could form a portfolio that has more or less same response to all the factors affecting the index except the inflation and had a minimal residual risk.

7. Credit risk in bond portfolio management is defined as the risk of the non-payment of principal and interest, downgrading and widening of credit swap. Downgrading risk is the risk of downgrading the instrument by the credit rating agencies. Return of the bond depends on the risk associated with it, a high rated bond gives lower return than a low rated bond. Credit spread risk is defined as an increase in the interest rate spread over a riskless bond like treasury bills due to purchase of risky bond. Credit derivative is one of the useful tools to diversify or acquire credit risk. Credit derivative is the negotiable financial instrument that is designed to transfer the credit risk of the assets or issuers between two or more parties. It may be in the form of an option, forward or swap where cash flows are linked with the credit characteristics of the bonds. Return from the credit derivative instrument may be the significant part of the portfolio return.

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CREDIT OPTION

Credit option is an instrument to protect against credit risk and is different from the standard debt option as the latter is designed to protect against interest rate risk. Credit option is of two types, one which is triggered by a decline in the value of assets and another which is triggered by a change in the asset's spread over a comparable risk-free rate.

There are two types of option writing on an underlying asset:

- Binary credit option with a predetermined pay-out
- Binary credit option based on credit rating.

In a binary credit option with a predetermined pay-out, the option seller has an obligation to pay-out a fixed sum in case of default, but in case of no default at the time of maturity, the option buyer will lose the premium. American binary option can be exercised anytime during its life whereas European binary credit option can be exercised at the time of maturity only.

Binary credit option based on credit rating is another type of option, which is exercised at the time when the credit rating falls below investment grade i.e., option buyer will get money if the credit agency downgrades the instrument below investment grade; otherwise, he will lose the premium. Thus, binary credit option deals with only two outcomes.

CREDIT FORWARD

Credit forward is a useful instrument for the buyer of the credit exposure and the portfolio manager who wishes to hedge the appreciated value of its portfolio. Like the credit option, credit forward may be contracted on bond value or credit spread. Portfolio managers can

hedge their earnings by purchasing the credit forward. Increase in the high-yield credit spread results in increase in the value of credit forward while decreasing the portfolio yield.

CREDIT SWAPS

Credit swaps are also of two types like credit options — credit default swap and total return swap. The difference between the two is that the rationale of a credit default swap is to hedge the credit exposure by selling it to a credit protection seller like the credit option while the total return swap is used to increase credit exposure and assume more risk for more return. Credit insurance and swapping risky credit are the two types of credit default swap. In credit insurance, the buyer of the credit protection pays a fee to the seller of the credit protection in return for the right to receive a fixed amount in case of the default of a referenced credit. The buyer of the credit protection continues to receive the total return on the referenced assets until the total return is negative due to default, widening credit spread or downgrading. An alternative to the credit insurance type is the investor agreeing to swap the total return on credit risky assets for fixed periodical payment from the credit protection seller; the pay-off is such that if the credit risk declines in value the investor will repay for the decline plus receive a periodical payment from the seller. This is referred to as swapping risky credit payments.

A total return credit swap is in fact used -to increase the credit exposure. It involves transferring of all of the economic exposure of the asset under consideration to the credit swap purchaser. It includes all cash flows that arise from the referenced assets and their capital appreciation or depreciation. The credit swap buyer pays a floating rate plus any depreciation of the referenced asset to the credit swap seller in return for the exposure assumed.

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