

Question Paper

Portfolio Management and Mutual Funds – I : April 2002

Part A : Basic Concepts (30 Points)

- This part consists of questions with serial number 1 - 30.
- Answer **all** questions.
- Each question carries one point.
- Maximum time for answering Part A is 30 Minutes.

1. The Jensen portfolio evaluation measure
 - I. Is an absolute measure of return over and above that predicted by the CAPM
 - II. Is a measure of net selectivity under Eugene Fama's decomposition of portfolio return
 - III. Is a measure of total selectivity under Eugene Fama's decomposition of portfolio return
 - a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (I) and (III) above.
2. The Money Weighted Rate of Return (MWROR) on a portfolio is equivalent to
 - a. The Time Weighted Rate of Return (TWROR)
 - b. The portfolio's internal rate of return
 - c. The arithmetic average return
 - d. The Linked Internal Rate of Return (LIROR)
 - e. Both (a) and (b) above.
3. As per Arbitrage Pricing Theory (APT), which is a multi factor model the return on any asset i is given by

$$R_i = \alpha_{i0} + \beta_{i1} I_1 + \beta_{i2} I_2 + \beta_{i3} I_3 + \dots + \beta_{im} I_m + e_i$$
 where the notations are in their standard use.

If the variance $(R_i) = 250(\%)^2$ and the above equation explain 60% of the total variance, then the variance of error term i.e. $\text{Var}(e_i)$ will be

 - a. Zero
 - b. $90(\%)^2$
 - c. $100(\%)^2$
 - d. $150(\%)^2$
 - e. $160(\%)^2$
4. Under stochastic dominance model of optimal portfolio selection Security A dominates Security B based on third order stochastic dominance if
 - I. Investors prefer more to less
 - II. Investors are risk averse
 - III. The third order derivative of utility function of investor is negative.
 - a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (II) above
 - d. Both (II) and (III) above
 - e. All (I), (II) and (III) of the above.

5. Changes in the requirements of the client need the rebalancing of portfolio. Which of the following is/are the factor(s) affecting the client?
- I. Change in Time Horizon
 - II. Change in Value of Investment
 - III. Change in return available on the investments
 - IV. Changes in liquidity needs.
- a. Both (I) and (II) above
 - b. Both (I) and (III) above
 - c. (I), (II) and (III) above
 - d. (II), (III) and (IV) above
 - e. All (I), (II), (III) and (IV) of the above.
6. Strip strategy used under portfolio management involves
- a. Buying a put and a call options on the same underlying stock, each of which has the same exercise price and same expiration date
 - b. Buying as well as selling call options on the same underlying stock, each of which has the same exercise price but different expiration dates
 - c. Buying a put and a call options on the same underlying stock for the same expiration date but at different exercise prices
 - d. Buying one call as well as two puts on the same underlying stock with the same exercise price and expiration date
 - e. Buying two calls as well as one put on the same underlying stock with the same exercise price and expiration date.
7. There are two general types of swaps widely used for the purpose of increasing total return of a portfolio:
- I. Risk-neutral swaps
 - II. Risk-altering swaps

Which of the following belong(s) to risk-neutral swaps?

- a. Pure yield pick-up swap
 - b. Substitution swap
 - c. Sector swap
 - d. Interest rate anticipation swap
 - e. Both (b) and (c) above.
8. Consider the following information of the portfolio of a fund manager:

Existing:	
Market value (Rs.)	200 crore
Beta of portfolio	1.2
Futures contract available on NIFTY:	
Market value (Rs.)	1300
Multiple	200

To achieve the target beta as 0.8 of the portfolio the fund manager should

- a. Sell 3077 futures
- b. Sell 3822 futures
- c. Buy 3077 futures
- d. Buy 3822 futures
- e. Buy 4037 futures.

9. Immunization is not a strictly passive strategy because
- It requires choosing an asset portfolio that matches an index
 - There is likely to remain a slight gap between the duration of assets and liabilities in most portfolios
 - Durations of assets and liabilities fall at the same rate
 - It requires frequent rebalancing as maturities and interest rates change
 - It requires to buy and sell securities with the passage of time.
10. In January 2002 Templeton Mutual Fund launched a new scheme “Templeton Floating Rate Fund”. The objective of the scheme is to align the dividend (under dividend plan) or yield (under growth plan) on a continuous (daily) basis with a selected benchmark rate. On a simple analysis it has the features similar to that of a floating rate bond. Such scheme has a target audience of
- The investors who wants to get the maximum from the fluctuation in interest rates
 - Corporates having short term surpluses
 - The investors who are very sensitive to the NAV of their investment.
- Only (I) above
 - Only (II) above
 - Both (I) and (II) above
 - Both (II) and (III) above
 - All (I), (II) and (III) of the above.
11. A zero-investment portfolio with a positive expected return arises when
- An investor has downside risk only
 - There is a difference between risk free lending and borrowing rates
 - A risk free arbitrage opportunity exists
 - The purchasing power parity
 - An investor has upside risk only.
12. Which of the following assumptions are common between Markowitz Model and APT?
- Investors are risk-averse, expected utility maximizers
 - Investors choose portfolios on the basis of their expected mean and variance of return
 - All investors have uniform and single period investment horizon.
- Only (I) above
 - Only (II) above
 - Both (I) and (II) of above
 - Both (II) and (III) of above
 - All (I), (II) and (III) of the above.
13. With the recent budget pronouncement on February 28, 2002 the dividend is once again taxed in the hand of the recipient.
- Consider the present risk-free interest rate as 8% and expected return on the market is 13.5%. The dividend yield on the market portfolio is 3%. The tax rate on dividend income is 30%, while the tax rate on the long-term capital gains is 20%. The expected return from an equity portfolio with β of 1.2 and the dividend yield of 5% will be approximately
- 13.00%
 - 13.75%
 - 14.60%
 - 15.00 %
 - 16.20%

14. At the prevailing environment the CML equation for a portfolio i is given as

$$E(r_i), \% = 8 + 0.36 \sigma_i$$

The ex-ante SML equation for the same portfolio i is

$$E(r_i), \% = 8 + 5.50 \beta_i$$

Therefore the variance of market portfolio is approximately

- a. $30(\%)^2$
 - b. $64(\%)^2$
 - c. $126(\%)^2$
 - d. $233(\%)^2$
 - e. Data insufficient.
15. According to SML which of the following statement(s) is **true** in presence of market imperfections?
- I. Stocks not plotting on the security market line provide evidence of mis-pricing in the market
 - II. SML is a band instead of a thin line
 - III. Theoretical predictions have not been supported by empirical tests.
- a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (II) above
 - d. Both (II) and (III) above
 - e. All (I), (II) and (III) above.
16. As per Bieler, Biehl and Kaiser Five-Way model, which of the following type of investors are halfway between complete confidence and anxiety as well as midway between extreme carefulness and impetuosity?
- a. Individualists
 - b. Adventurers
 - c. Celebrities
 - d. Guardians
 - e. Straight Arrows.
17. Consider a portfolio's expected return is 12%, variance of return is $144(\%)^2$. The risk tolerance assured for Mr. Srinivas Natarajan is 65%. Therefore, the utility of the portfolio for Natarajan is
- a. 5.4%
 - b. 9.8%
 - c. 26.6%
 - d. 38.5%
 - e. 53.0%
18. Which of the following is/are perils of over diversification?
- I. Cost of investing goes up
 - II. Good performer may be lost in the crowd
 - III. Provides nil or very low return.
- a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (II) above
 - d. Both (II) and (III) above
 - e. All (I), (II) and (III) of the above.

19. Which of the following is **not true** for formula plans?
- For effective implementation of constant dollar value plan, it is necessary to estimate the possibility and extent of downward fluctuation in the value of aggressive portfolio
 - One of the drawbacks of constant ratio plan is that it becomes more aggressive in buying stocks when the stock prices fall and less aggressive in selling stocks when the stock prices rise
 - In variable ratio plan one should start the plan when the stock prices are at the end of bear phase
 - During a sustained rise or fall of stock prices the constant ratio plan gives higher profit than the constant dollar value plan or even the variable ratio plan
 - None of the above.
20. Which of the following statements are **true** in view of conflicts arising between Sharpe's and Treynor's measure while ranking the portfolios?
- Jensen's measure should be used to rank the portfolios
 - Sharpe's ratio should be used when we expect substantial presence of unsystematic risk in the portfolios
 - Treynor's ratio should be used when the portfolio is fully diversified.
- Only (I) above
 - Both (I) and (II) above
 - Both (I) and (III) above
 - Both (II) and (III) above
 - All (I), (II) and (III) of the above.
21. What is the expected return of a zero beta portfolio?
- The risk-free rate
 - Zero rate of return
 - A negative rate of return
 - The market rate of return
 - None of the above.
22. Mr. Sen is having a portfolio of 75 scrips. To use Markowitz model he must have
- 2888 estimates
 - 2925 estimates
 - 2940 estimates
 - 3950 estimates
 - 5850 estimates.
23. A portfolio consists of three scrips A, B and C. Returns on these scrips are expected to be 15%, 13% and 17% respectively. Weightage of scrip A is double of that B and weightage of B is double of that C. Calculate the expected return of portfolio.
- 12.42%
 - 14.73%
 - 52.23%
 - 57.14%
 - 73.70%
24. The portfolio of Mr. Sarkar had a beginning value of Rs.100 lakhs and after a year an ending value of Rs.121 lacs. If Mr. Sarkar, receives Rs.10.5 lakhs at the end of 6 months as dividends then the money weighted rate of return (MWROR) of Mr. Sarkar's portfolio is
- 9.5%
 - 10.0%
 - 10.5%
 - 11.0%
 - 11.5%.

25. AAA bond of Attire Co. of face value Rs.100 and coupon of 10% is currently selling in the market at Rs.100. The bond presently has 4 years to maturity. What is the percentage change in the price of the bond, if there is 100 BP increase in the market interest rate, when the coupon is paid annually?
- Increases by 1.90%
 - Increases by 2.90%
 - Decreases by 1.90%
 - Decreases by 2.90%
 - Decreases by 3.64%.

26. Assume there are three portfolios with risk-return characteristics given as under:

Portfolio	$E(r_i)$	Risk (β_i)
P	12.5	1.4
Q	14.0	1.0
R	15.5	0.8

Under the assumptions of APT riskless profit strategy would be,

- Constructing a hypothetical portfolio by allotting 50% weight each to P&Q, short sale of the hypothetical portfolio and going long on portfolio R
 - Constructing a hypothetical portfolio by allotting 33% weight to P and 67% weight to Q. Short sale of hypothetical portfolio and going long on portfolio R
 - Constructing a hypothetical portfolio by allotting 50% weight each to P&Q. Short sale portfolio R and going long on hypothetical portfolio
 - Constructing a hypothetical portfolio by allotting 33% weight to P and 67% weight to Q. Short sale of portfolio R and going long on hypothetical portfolio
 - Both (a) and (d) above.
27. Consider the regression equation between return on Pioneer ITI fund and that of return on market is given by
- $$R_p = a_p + b r_m + c r_m^2$$
- Where the notation are in their standard use
If the value c in the above equation is positive then
- The curve becomes steeper as value of r_m increases
 - The curve becomes milder as value of r_m decreases
 - The fund manager has reflected better selection skills
- Only (I) above
 - Only (II) above
 - Both (I) and (II) above
 - Both (I) and (III) above
 - All (I), (II) and (III) above.
28. In equity portfolio management, active managers are first hired to add value. However, this creates 'holes' – where lack of equity market coverage exists. The passive fund is then created to fill in these holes are called
- Customized funds
 - Factor fund
 - Style fund
 - Completeness fund
 - Both (b) and (c) above.

29. Under bond portfolio management which of the following is/are semi active strategies
- I. Bond laddering
 - II. Dedication
 - III. Immunization.
- a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (II) above
 - d. Both (II) and (III) above
 - e. All (I), (II) and (III) of the above.
30. A fund manager who has moderately bearish belief about the underlying asset can hedge his risk using
- a. Buying two puts and a call at strike price equal to prevailing market price and all the options are of same expiration time
 - b. Buying two calls and a put at strike price equal to prevailing market price and all the options are of same expiration time
 - c. Buy a call at strike price less than prevailing market price and sell a call at higher than prevailing market price and both the options are of same expiration time
 - d. Buy a put at strike price less than prevailing market price and sell a put at higher than prevailing market price and both the options are of same expiration time
 - e. Sell a call at strike price less than prevailing market price and buy a call at higher than prevailing market price and both the options are of same expiration time.

END OF PART A

Part B : Problems (50 Points)

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

1. Consider the following details regarding a bond recently issued by Jaishree Chemicals:

Date of issue	Years to maturity	Face value and Redemption value	Coupon
1.4.2002	5	Rs.1000	10% paid annually

The present term structure of interest rates for issues of same credit quality as Jaishree Chemicals is as follows:

Year to maturity	1	2	3	4	5
Yield (%)	9.5	9.75	10.00	10.25	10.50

Assume that the term structure at the end of one year will be as under:

Year to maturity	1	2	3	4	5
Yield (%)	9.0	9.25	9.5	9.75	10.00

You are **required** to

- Find total return from the bond over a one year period
- Show that the total return from the bond is equal to the sum of
 - Current yield
 - Amortization of premium or discount
 - Price change due to slope
 - Price change due to shift in yield curve.

(4 + 4 = 8 points)

2. Shankarshan Roy, a portfolio manager is of the opinion that share of Satyam Computers will rise. He is considering the following quotation relating to options on the share of Satyam Computers:

Company	Current market price (Rs.)	Instrument type	Expiry date	Strike price (Rs.)	Premium (Rs.)	No. of shares per contract
Satyam Computers	280	Call option	25.04.2002	280	20	1200
		Put option	30.05.2002	280	10	1200

Mr. Roy estimates the probability distribution of price of Satyam Computers share as follows:

Price per share	Probability of share price	
	on 25.04.2002	On 30.05.2002
260	0.03	0.00
270	0.07	0.05
280	0.10	0.10
290	0.20	0.15
300	0.45	0.30
310	0.15	0.40

Debashish Sarkar is a high networth client of Mr. Roy. Mr. Sarkar is relatively conservative and the utility values for the changes in his asset are as under:

Change (Rs.)	+36,000	+24,000	+12,000	0	-12,000	-24,000
Utility	1.0	0.8	0.7	0.6	0.1	0

Ignoring the time value of money you are **required** to find out which from the following three alternatives maximizes the expected utility of Mr. Sarkar, if he

- Buys now one call option contract expiring on 25.04.2002
- Sells now one put option contract expiring on 30.05.2002
- Buys now 1200 shares of Satyam Computers and sell them on 30.05.2002.

(4 + 4 + 2 = 10 points)

- Mr. Adesh Malhotra is trying to construct an optimal portfolio with least risk and a target return of 16% p.a. from the three stocks namely Dabur, Grasim and Finolex. The relevant market data is given as under:

Stock	Expected monthly return	Standard deviation	Variance-covariance matrix (%) ²		
			Dabur	Grasim	Finolex
Dabur	18%	17%	289	90	140
Grasim	20%	24%	90	400	195
Finolex	13%	15%	140	195	225

You are **required** to calculate the proportions of funds to be invested in each of the three securities by Mr. Malhotra so as to generate a return of 16% with least possible risk.

(14 points)

- Joy Anthony, an investor is trying to analyze the selection skills of 4 fund managers. You are an analyst whom he approaches for advice. The relevant data about the funds is given as under:

Fund	Return (%)	Unsystematic risk	Beta
JM Mutual Fund	24.00	18.00(%) ²	1.32
Dundee Mutual Fund	19.32	17.00(%) ²	1.21
Alliance Mutual Fund	18.36	13.00(%) ²	1.09
First India Mutual Fund	21.76	16.00(%)	1.11
Market	18.00	—	1.00

The variance on the return from the market portfolio is 324(%)². The risk free rate of return is 8%.

For the above four fund managers, you are **required** to find

- Return due to selectivity
- Return due to net selectivity
- Which of the above fund managers have exhibited superior selection skills?

(3 + 3 + 2 = 8 points)

- Recently, PIONEER ITI came out with PE ratio fund. The fund attempts to give more stable return in comparison to an existing closed ended Index fund following NIFTY.

Under normal market circumstances, the asset allocation range would be as follows:

PE ratio* of NIFTY	Equities comprised NSE NIFTY Index (%)	Debt/Money Market Instrument (%)
Upto 11	100	0
11 – 15	90	10
15 – 20	70	30
24 – 28	30	70
Above 28	10	90

* The price to earnings ratio (PE ratio) will be obtained from an agency such as IISL. It will be weighted average PE ratio of the 50 stocks that constitute NSE NIFTY Index.

The allocation changes in the fund are effected at the end of every month. Relevant data of NSE NIFTY is as under:

Month	Closing value of NSE NIFTY	P/E	Monthly Dividend Yield (%)
March, 2001	1148.20	17.21	1.13
April, 2001	1207.72	15.57	0.60
May, 2001	1266.96	15.80	0.81
June, 2001	1193.80	15.76	0.89
July, 2001	1159.68	15.15	1.17
August, 2001	1141.48	15.10	1.35
September, 2001	991.77	13.16	1.64
October, 2001	1055.47	13.79	1.61
November, 2001	1159.08	15.46	1.50
December, 2001	1150.28	15.35	1.52
January, 2002	1168.10	16.99	1.72
February, 2002	1142.05	18.33	1.59
March, 2002	1298.04	19.23	1.37

The average return on debt instruments in last one year is 13%. Ignoring cost of rebalancing, you are **required to**

- Calculate the yield on Index fund over last one year period.
- Calculate the yield of the PE Ratio fund assuming it is under operation from April, 2001.
- Enumerate the merits and demerits of PE Ratio fund in comparison with Index fund.

(3 + 5 + 2 = 10 points)

END OF PART B

Part C : Applied Theory (20 Points)

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

- Asset allocation is at the same time dynamic and integrated. Depending on the process of asset allocation, there can be various forms of asset allocation. Discuss the popular approach of asset allocation.

(10 points)

- Individual investors are unsophisticated in their perception of risk. In comparison to it institutions are more sophisticated. Discuss the commonly seen misconceptions of individual investors regarding risk.

(10 points)

END OF PART C

END OF QUESTION PAPER

Suggested Answers

Portfolio Management and Mutual Funds – I : April 2002

Part A : Basic Concepts

1. Answer : (e)

Reason : As per Eugene Fama's decomposition of portfolio return,

Total selectivity = Net selectivity + Return produced by the portfolio due to inadequate diversification.

$$\text{Total selectivity} = R_A - R'_A = R_A - [R_f + \beta_P (R_m - R_f)]$$

The right hand side of the above expression is the same as Jensen's Alpha. Further, from the expression it can be seen that Jensen's measure is an absolute and not a relative measure.

2. Answer : (b)

Reason : In presence of intermediate cash flows money weighted rate of return (MWROR) and time weighted rate of return (TWROR) will give different results. In fact in such situation TWROR is used to avoid distorting effect of the intermediate flows. However, in any circumstances IRR and MWROR are the same.

3. Answer : (c)

Reason : Variance (r_i) = Variance explained by the factor model + unexplained variance i.e., variance of error term

$$250 = 0.6 \times 250 + \text{Var}(e_i)$$

$$\text{Var}(e_i) = 250 - 0.6 \times 250 = 100 (\%)^2$$

4. Answer : (c)

Reason : Under stochastic Dominance model of optimal portfolio selection security A dominates security B on third order stochastic dominance if

- i. Investors prefer more to less
- ii. Investors are risk averse
- iii. The third order derivative of the utility function is positive
- iv. The mean return from A is greater than the mean return from B
- v. The sum of the cumulative probabilities across all returns is never more for A than B and is sometimes less.

5. Answer : (e)

Reason : All the factors given affect the clients which make it necessary to change the portfolio composition.

6. Answer : (d)

Reason : Alternative (a) is straddle strategy. Alternative (b) pertains to horizontal spread strategy. Alternative (c) is used under strangle strategy whereas (d) is used under strip strategy. The strategy under (e) pertains to strap.

7. Answer : (e)

Reason : Pure yield pick-up swap and interest rate anticipation swap belong to Risk – altering swaps as they alter the market risk of the portfolio.

8. Answer : (a)

Reason : The present β is more than 1.0 hence the portfolio manager should sell the Nifty futures. If he/she sells x number of contracts to arrive the target $\beta = 0.8$ then

$$200 \times 1.2 - \frac{1300 \times 200 \times x \times 1}{10^7} = 200 \times 0.8$$

$$\Rightarrow x = \frac{200(1.2 - 0.8) \times 10^7}{1300 \times 200} = 3077 \text{ futures.}$$

9. Answer : (d)

Reason : 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 require 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.

10. Answer : (d)

Reason : As the simple analysis says the fund resembles the floating rate bond. It means that when the interest rate goes up the investors gets more return and vice-versa. As the dividend yield is getting aligned on the continuous basis the **corpus or NAV** of the fund will remain more or less same. Therefore, it will attract the short term surpluses from corporates as well as the investors who are very sensitive to fluctuations of NAV of their investments.

11. Answer : (c)

Reason : Under the risk-free arbitrage opportunity, an investor can make riskless profit due to market inefficiency in semi-strong form i.e., the fundamentals may not be reflected in the current market price of the asset or its derivatives.

12. Answer : (a)

Reason : The statement II which states that the Investors choose portfolios on the basis of their expected mean return and the variance of return is an assumption of Markowitz model which APT does not assume.

Statement III is a specific assumption of CAPM which is assumed neither by Markowitz nor APT.

13. Answer : (d)

Reason : Tax factor, $T = \frac{T_d - T_g}{1 - T_g}$ Where the notations are in their standard use

$$= \frac{0.3 - 0.2}{1 - 0.2} = \frac{0.1}{0.8} = 0.125$$

Using the tax-adjusted CAPM,

Expected return on portfolio i ,

$$E(r_i) = r_f (1 - T) + \beta_i [E(r_m) - r_f (1 - T) - TD_m] + TD_i$$

Where the notations are in their standard use

$$\begin{aligned} E(r_i) &= 8(1 - 0.125) + 1.2[13.5 - 8(1 - 0.125) - 0.125 \times 3] + 0.125 \times 5 \\ &= 14.975 \cong 15\% \end{aligned}$$

14. Answer : (d)

Reason : Form of CML is $E(R_i) = R_f + \left(\frac{R_m - R_f}{\sigma_m} \right) \sigma_i$

& of ex-ante SML is $E(R_i) = R_f + (R_m - R_f) \beta_i$

Therefore, $\frac{R_m - R_f}{\sigma_m} = 0.36$

$(R_m - R_f) = 5.50$

From the above equations, $\sigma_m^2 = (5.5/0.36)^2 = 233.4$ i.e., 233%.

15. Answer : (e)

Reason : Statement I is obvious as the reason for deviation from the ex-ante SML indicates the mispricing of the stock.

Statement II is true because:

- i. Transactions costs may reduce investors' incentive to correct minor deviations than the potential opportunity presented by the mispricing.
- ii. Investors subject to taxes might be reluctant to sell an overvalued securities.
- iii. Some investors are less informed than others

Statement III is true because the estimated relationship does not conform to the hypothesized CAPM relationship. Though the model is widely used, its theoretical predictions have not been supported by empirical tests.

16. Answer : (e)

Reason :	Individualists	:	They are confident and careful.
	Adventurers	:	They generally go for big bets and for which they have the resources and are willing to take risks
	Celebrities	:	Celebrities are those who are swayed too much by the trend
	Guardians	:	They are both anxious and careful

17. Answer : (b)

Reason : $Utility = 12 - \frac{144}{65} = 9.785\% \text{ i.e., } 9.8\%$

18. Answer : (e)

Reason : Over diversification requires too much effort and energy entailing higher cost of investing. Good performers can get lost in the crowd minimizing their positive impact on the overall portfolio. Further, over diversification can theoretically create a perfect hedge and thus produce a flat or zero return.

19. Answer : (c)

Reason : To achieve the result successfully under variable ratio plan one should start the plan when the stock prices are at a median value.

20. Answer : (d)

Reason : Jensen's measure is an absolute measure and this measure in no way resolves the ranking conflict due to systematic and unsystematic risk of portfolio.

21. Answer : (e)

Reason : Due to absence of true risk-less return, the CAPM is modified as the efficient frontier is arrived by joining global minimum – variance portfolio (MVP), and portfolio z. The MVP which is least sensitive with market is known as zero beta portfolio and return, on this is the same (r_z) which replace risk free return (r_f) of CAPM.

22. Answer : (b)

Reason : To use Markowitz framework of a portfolio of n scrips one needs n returns, n variances and $\frac{n(n-1)}{2}$ unique covariance estimates, i.e., in all $\frac{n(n+3)}{2} = \frac{n^2 + 3n}{2}$ estimates Hence, required

$$\text{number of estimates} = \frac{75^2 + 3 \times 75}{2} = 2925.$$

23. Answer : (b)

Reason : Consider the proportion invested in C is x
Hence the proportion invested in B and A would be $2x$ and $4x$
i.e., $4x + 2x + x = 100$

$$\Rightarrow x = \frac{100}{7} = 14.286\% = 0.143$$

Hence return from the portfolio

$$= 4 \times 0.143 \times 15 + 2 \times 0.143 \times 13 + 0.143 \times 17 = 14.729 \text{ i.e., } 14.73\%.$$

24. Answer : (b)

Reason : $100(1+r) + 10.5(1+r)^{1/2} = 121$

At $r = 10\%$, L.H.S. = 121.01

Hence, MWROR = 10%.

25. Answer : (e)

Reason : As the face value and prevailing market price of Attire bond is same hence,

YTM = Coupon rate = 10%

& Duration = Years to maturity = 4 years

Hence, modified Duration = $\frac{\text{Duration}}{1+r} = \frac{4}{1.1} = 3.64$

% change in price = Modified duration $\times \frac{(-)\Delta BP}{100}$

= $3.64 \times \frac{(-)\times 100}{100} = -3.64\%$

i.e., 3.64% decrease in price.

26. Answer : (d)

Reason : Expected Risk of hypothetical portfolio constructed giving 33% weightage to P & 67% weightage to Q

$\beta_{\text{Portfolio}} = 1.4 \times 0.33 + 0.8 \times 0.67 = 0.998 \cong 1.0$

Expected return from above hypothetical portfolio

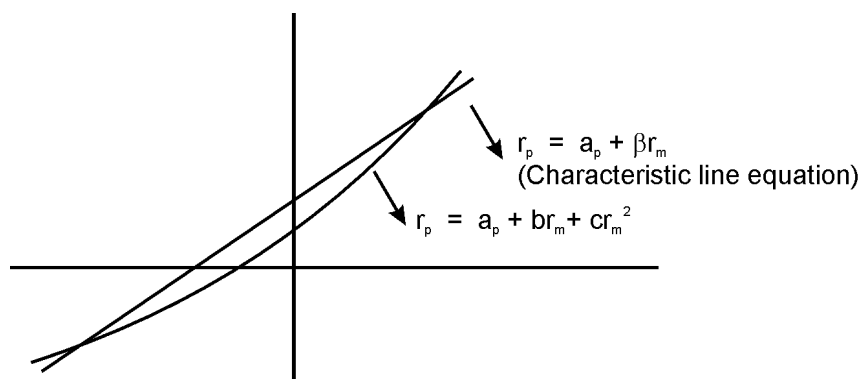
$E(RP) = 12.5 \times 0.33 + 15.5 \times 0.67 = 14.51$

$\cong 14.5\%$

We find that the hypothetical portfolio has same risk (β_{port}) that of portfolio Q and more return 14.5%. Therefore, risk less profit can be made by short sale of portfolio Q and going long on hypothetical portfolio.

27. Answer : (c)

Reason : Statements I & II are correct as shown below



Statement III is not correct as the above second order regression equation reveals that fund manager was anticipating market changes accurately, and the superior performance of fund can be attributed to the skills in timing the market.

28. Answer : (d)

Reason : The passive strategy to fill in these holes completes the desired coverage and hence it is called completeness fund.

29. Answer : (c)

Reason : Bond laddering is a passive strategy because it involves investing in bonds with several maturity dates to minimize fluctuations in the current level of income. Normally, no intermediate revision takes place. Dedication and Immunization are semi-active strategies where intermediate revisions are required because of changing circumstances.

30. Answer : (e)

Reason : For a moderately bearish belief, the right strategy is bearish vertical spread using calls or puts. Therefore, alternative (e) is correct. Alternatives (a) pertains to strip strategy whereas (b) pertains to strap strategies. Alternatives (c) & (d) pertain to bullish vertical spreads.

Part B : Problems

1. a. Current Market Price,

$$P_0 = 100 \times \text{PVIFA} (10.50, 5) + 1,000 \times \text{PVIF} (10.5\%, 5)$$

$$= 100 \times \frac{(1.1050)^5 - 1}{0.1050 \times (1.1050)^5} + \frac{1000}{(1.1050)^5}$$

$$= 100 \times 3.743 + 1000 \times 0.607 = \text{Rs.} 981.3$$

Market price of bond after 1 year at discount of 9.75% in accordance of new yield curve

$$P_1 = 100 \times \text{PVIFA} (9.75\%, 4) + 1,000 \times \text{PVIF} (9.75\%, 4)$$

$$= 100 \times \frac{(1.0975)^4 - 1}{0.0975 \times (1.0975)^4} + \frac{1000}{(1.0975)^4}$$

$$= 100 \times 3.187 + 1000 \times 0.689 = \text{Rs.} 1007.7$$

Market price of bond after 1 year at the discount rate of 10.5% assuming a flat yield curve

$$P'_1 = 100 \times \text{PVIFA} (10.5\%, 4) + 100 \times \text{PVIF} (10.5\%, 4)$$

$$= 100 \times \frac{(1.1050)^4 - 1}{0.1050 \times (1.1050)^4} + \frac{1,000}{(1.1050)^4}$$

$$= 100 \times 3.136 + 1,000 \times 0.671 = \text{Rs.} 984.6$$

Market price of bond after 1 year at the discount rate of 10.25%

$$P''_1 = 100 \times \frac{(1.1025)^4 - 1}{0.1025 \times (1.1025)^4} + \frac{1,000}{(1.1025)^4}$$

$$= 100 \times 3.153 + 1000 \times 0.677 = \text{Rs.} 992.3$$

Total return for holding the bond for a year

$$= (\text{coupon income} + \text{price change}) / \text{initial price}$$

$$= [(100 + (1007.7 - 981.3)) / 981.3]$$

$$= 0.129 \text{ i.e., } 12.9\%.$$

- b. Total Return = C + A + R + I

i. Current yield, $C = \frac{100}{981.3} = 0.102 \text{ i.e., } 10.2\%$

ii. Amortization of premium/discount, $A = \frac{\text{Price change on level yield curve}}{\text{Initial or beginning price}}$

$$= \frac{984.6 - 981.3}{981.3} = 0.003 \text{ i.e., } 0.3\%$$

iii. Price change due to slope, $R = \frac{992.3 - 984.6}{981.3} = 0.008 \text{ i.e., } 0.8\%$

iv. Return on account of change in Interest Rate, $I = \frac{1007.7 - 992.3}{981.3} = 0.016 \text{ i.e., } 1.6\%$

Therefore, total return = 10.2 + 0.3 + 0.8 + 1.6 = 12.9% as arrived in (a) above.

2. a. Call option contract expiring on 25.04.2002

Expiration Day Price	Gain (Loss) due to one call option	Change in Asset value	Probability	Utility
260	(-) 20	(-) 20 × 1200 i.e., (-) 24,000	0.03	0
270	(-) 20	(-) 20 × 1200 i.e., (-) 24,000	0.07	0
280	(-) 20	(-) 20 × 1200 i.e., (-) 24,000	0.10	0
290	(-) 10	(-) 10 × 1200 i.e., (-) 12,000	0.20	0.1
300	0	0 × 1200 i.e., 0	0.45	0.6
310	10	10 × 1200 i.e., 12,000	0.15	0.7

$$\begin{aligned}\text{Therefore, estimated utility} &= 0.03 \times 0 + 0.07 \times 0 + 0.10 \times 0 + 0.2 \times 0.1 + 0.45 \times 0.6 + 0.15 \times 0.7 \\ &= 0.395\end{aligned}$$

b. Put option contract expiring on 30.05.2002

Expiration Day Price	Gain/Loss due to one put option	Change in Asset Value	Probability	Utility
260	(-) 10	(-)10 × 1200 i.e., (-)12,000	0.00	0.1
270	0	0 × 1200 i.e., = 0	0.05	0.6
280	10	10 × 1200 = 12,000	0.10	0.7
290	10	12,000	0.15	0.7
300	10	12,000	0.30	0.7
310	10	12,000	0.40	0.7

$$\begin{aligned}\text{Therefore estimated utility} &= 0.00 \times 0.1 + 0.05 \times 0.6 + 0.1 \times 0.7 + 0.15 \times 0.7 + 0.3 \times 0.7 + 0.4 \times 0.7 \\ &= 0.695.\end{aligned}$$

c. Buying now 1,200 Satyam Shares and selling on 30.5.2002

Price as on 30.5.2002	Change in Asset Value	Probability	Utility
260	- 24,000	0.00	0
270	- 12,000	0.05	0.1
280	0	0.10	0.6
290	12,000	0.15	0.7
300	24,000	0.30	0.8
310	36,000	0.40	1.0

$$\begin{aligned}\text{Expected utility} &= 0.00 \times 0 + 0.05 \times 0.1 + 0.1 \times 0.6 + 0.15 \times 0.7 + 0.3 \times 0.8 + 0.4 \times 1.0 \\ &= 0.81\end{aligned}$$

Therefore, the expected utility of Mr. Sarkar is maximum under third alternative.

3. Assume the proportion invested in Dabar, Grasim and Finolex are X_A , X_B and X_C respectively. Minimize (Total risk of portfolio)

$$\begin{aligned}Z &= 289 X_A^2 + 400 X_B^2 + 225 X_C^2 + (2 \times 90 \times X_A X_B) \\ &\quad + (2 \times 140 \times X_A X_C) + (2 \times 195 X_C X_B)\end{aligned}\quad (I)$$

Subject to:

$$18X_A + 20X_B + 13X_C = 16 \quad (II)$$

$$X_A + X_B + X_C = 1 \quad (III)$$

We have to incorporate the return constraint (2) as part of the objective function (1) using the langrarian constraint λ . For this, first we express X_C in terms of X_A and X_B as $(1 - X_A - X_B)$, using constraint (3) in both the equations (1) and (2) and this replacement will transform the equation (1) into two variable equations.

$$\begin{aligned}
Z &= 289 X_A^2 + 400 X_B^2 + 225 (1 - X_A - X_B)^2 + (2 \times 90 \times X_A X_B) + 2 \times 140 X_A \times (1 - X_A - X_B) \\
&\quad + 2 \times 195 X_B (1 - X_A - X_B) \\
&= 289 X_A^2 + 400 X_B^2 + 225 (1 + X_A^2 + X_B^2 + 2X_A X_B - 2X_A - 2X_B) + 280 X_A (1 - X_A - X_B) \\
&\quad + 390 X_B (1 - X_A - X_B) \\
&= 289 X_A^2 + 400 X_B^2 + 225 + 225 X_A^2 + 225 X_B^2 + 450 X_A X_B - 450 X_A - 450 X_B + 280 X_A \\
&\quad - 280 X_A^2 - 280 X_A X_B + 390 X_B - 390 X_A X_B - 390 X_B^2 \\
&= 289 X_A^2 + 225 X_A^2 - 280 X_A^2 + 400 X_B^2 + 225 X_B^2 - 390 X_B^2 + 450 X_A X_B - 280 X_A X_B \\
&\quad - 390 X_A X_B - 450 X_A + 280 X_A - 450 X_B + 390 X_B + 225 = 0 \\
&= 234 X_A^2 + 235 X_B^2 - 220 X_A X_B - 170 X_A - 60 X_B + 225 = 0
\end{aligned}$$

Expressing X_C in terms of X_A and X_B equation 2 above is modified as

$$\begin{aligned}
18X_A + 20X_B + 13 (1 - X_A - X_B) &= 16 \\
18X_A + 20X_B + 13 - 13X_A - 13X_B &= 16 \\
= 5X_A + 7X_B &= 3 \\
\text{or } 5X_A + 7X_B - 3 &= 0 \quad (IV)
\end{aligned}$$

Using lagrangian multiplier, the revised objective function is

$$\begin{aligned}
Z &= 234 X_A^2 + 235 X_B^2 - 220 X_A X_B - 170 X_A - 60 X_B + 225 + \lambda (5X_A + 7X_B - 3) \\
&= 234 X_A^2 + 235 X_B^2 - 220 X_A X_B - 170 X_A - 60 X_B + 225 + 5X_A \lambda + 7X_B \lambda - 3\lambda
\end{aligned}$$

Now for optimization setting first derivatives with respect to X_A , X_B & λ equal to zero we get

$$\frac{\partial Z}{\partial X_A} = 468X_A - 220 X_B - 170 + 5\lambda = 0 \quad (V)$$

$$\frac{\partial Z}{\partial X_B} = 470 X_B - 220 X_A - 60 + 7\lambda = 0 \quad (VI)$$

$$\frac{\partial Z}{\partial \lambda} = 5X_A + 7X_B - 3 = 0 \quad (VII)$$

$$\text{From (V)} \times 7 \text{ we get } 3276X_A - 1540 X_B + 35\lambda = 1190$$

$$\begin{array}{rcl} \text{\& (VI)} \times 5 \text{ we get} & -1100 X_A + 2350 X_B + 35\lambda & = 300 \\ & + \quad - \quad - & \end{array}$$

$$\text{On subtracting} \quad 4376X_A - 3890 X_B = 890 \quad (VIII)$$

Taking (VII) and (VIII) we have:

$$4376X_A - 3890 X_B = 890$$

$$5X_A + 7 X_B = 3$$

$$\text{From (VIII)} \times 5 \text{ we get } 21880 X_A - 19450 X_B = 4450$$

$$\text{\& (VII)} \times 4376 \text{ we get } 21880 X_A + 30632 X_B = 13128$$

$$\text{On subtracting} \quad -50082X_B = -8678$$

$$\begin{aligned}
X_B &= 8678 / 50082 = 0.1732 \text{ or } 17.32\%. \\
5X_A + 7X_B &= 3 \\
= 5X_A + 7(0.1732) &= 3 \\
5X_A + 1.2124 &= 3 \\
5X_A &= 1.7876 \\
X_A &= 1.7876/5 = 0.3575 \text{ or } 35.75\% \\
X_C &= 1 - 0.3575 - 0.1732 \\
&= 0.4693. \\
R_p &= 18(0.3575) + 20(0.1732) + 13(0.4693) \\
&= 6.435 + 3.46 + 6.10 \\
&= 16\%.
\end{aligned}$$

4. a.

Fund	R_i	σ_{ei}^2	β_i	$\hat{\alpha}_i^2 \sigma_m^2$	$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{ei}^2$
JM Mutual Fund (A)	24.00	18.00	1.32	564.54	582.54
Dundee Mutual Fund (B)	19.32	17.00	1.21	474.36	491.36
Alliance Mutual Fund (C)	18.36	13.00	1.09	384.94	397.94
First India Mutual Fund (D)	21.76	16.00	1.11	399.20	415.20

Fund	$R_f + \beta_i (R_m - R_f)$	R_i	Return due to selectivity
A	21.20	24.00	2.80
B	20.10	19.32	- 0.78
C	18.90	18.36	- 0.54
D	19.10	21.76	2.66

b.

Fund	$R_f + \sigma_i/\sigma_m (R_m - R_f)$	Return due to net selectivity
A	21.40	2.60
B	20.31	- 0.99
C	19.08	- 0.72
D	19.32	2.44

- c. From the results available from (b) above we find J.M. Mutual Fund and First India Mutual Fund managers have shown superior selection skill in comparison to other two. Further, J.M. Mutual Fund is best performer as return obtained over and above diversifiable risk (net selectivity) is highest.

5. a. Return on Index fund following Nifty

$$= \frac{\text{Dividend Received during the period} + \text{Price change in Index Value}}{\text{Beginning Index Value}}$$

Dividend received during the one year period

$$\begin{aligned}
&= 1207.72 \times 0.006 + 1266.96 \times 0.0081 + 1193.80 \times 0.0089 + 1159.68 \times 0.0117 + 1141.48 \times 0.0135 \\
&\quad + 991.77 \times 0.0164 + 1055.47 \times 0.0161 + 1159.08 \times 0.0150 + 1150.28 \times 0.0152 + 1168.10 \times 0.0172 \\
&\quad + 1142.05 \times 0.0159 + 1298.04 \times 0.0137 \\
&= \text{Rs.}181.27
\end{aligned}$$

Price change During the one year period

$$= 1298.04 - 1148.20 = \text{Rs.}149.84$$

$$\begin{aligned}
\text{Therefore, return on Index fund} &= \frac{181.27 + 149.84}{1148.20} \\
&= 0.288 \text{ i.e., } 28.8\%.
\end{aligned}$$

b.

Month Ending	P/E ratio of NIFTY	% allocation in Index	% allocation in Bond & Money Market
March, 2001	17.21	70	30
April, 2001	15.57	70	30
May, 2001	15.80	70	30
June, 2001	15.76	70	30
July, 2001	15.15	70	30
Aug, 2001	15.10	70	30
Sep, 2001	13.16	90	10
Oct, 2001	13.79	90	10
Nov, 2001	15.46	70	30
Dec, 2001	15.35	70	30
Jan, 2002	16.99	70	30
Feb, 2002	18.33	70	30
Mar, 2002	19.23	70	30

From above it is clear that portfolio is changing twice one at the end of Sep, 2001 and second at the end of Nov, 2001.

I. Return up to September, 2001

i. On investment in Index

$$\begin{aligned}\text{Dividend received} &= 1207.72 \times 0.006 + 1266.96 \times 0.0081 + 1193.80 \times 0.0089 + \\ &\quad 1159.68 \times 0.0117 + 1141.48 \times 0.0135 + 991.77 \times 0.0164 \\ &= 73.38.\end{aligned}$$

$$\text{Price change} = 991.77 - 1148.20 = (-) 156.43$$

Hence yield on Index fund for 6 months period

$$= \frac{73.38 - 156.43}{1148.20} = (-) 0.072 \text{ i.e., } (-) 7.2\%$$

ii. Therefore, return on PE Ratio fund for 6-months period

$$= 0.7 \times (-) 7.2 + 0.3 \times 13 \times \frac{1}{2} = (-) 3.09\%$$

II. Return for the period October, 2001 to Nov, 2001

i. On investment in Index

$$\begin{aligned}\text{Dividend received} &= 1055.47 \times 0.0161 + 1159.08 \times 0.0150 \\ &= \text{Rs.} 34.38.\end{aligned}$$

$$\text{Price change} = 1159.08 - 991.77 = 167.31$$

Hence, yield on Index fund for two months

$$= \frac{34.38 + 167.31}{991.77} = 0.203 \text{ i.e., } 20.3\%$$

ii. Therefore, return on PE Ratio fund for 2 – month period

$$= 0.9 \times (20.3) + 0.1 \times 13 \times \frac{2}{12} = 18.49\%$$

III. Return for the period Dec, 2001 to March, 2002

i. On investment in Index

$$\begin{aligned}\text{Dividend received} &= 1150.28 \times 0.0152 + 1168.1 \times 0.0172 + 1142.05 \times 0.0159 \\ &\quad + 1298.04 \times 0.0137 \\ &= 73.52\end{aligned}$$

$$\text{Price change} = 1298.04 - 1159.08 = \text{Rs.} 138.96$$

Hence, yield on Index fund for five months

$$= \frac{73.52 + 138.96}{1159.08} = 0.183 \text{ i.e., } 18.3\%$$

ii. Therefore, return on PE Ratio fund for four month period

$$= 0.7 \times 18.3 + 0.3 \times 13 \times \frac{4}{12} = 14.10 \%$$

IV. Overall return on PE ratio fund for 12 month period

$$(1 + r) = (1 - 0.0309) (1 + 0.1849)(1.1410)$$

$$= 1.310\%$$

$$r = 31.0\%$$

Therefore, the PE ratio fund has out performed the index fund following Nifty.

c. Merits of PE ratio fund

- Less volatility of the fund NAV
- Superior risk-adjusted returns through a dynamically balanced portfolio
- The strategy does not require extensive research.

Demerits of PE Ratio fund

- It is a passive strategy and expected to give less return in continuously rising index
- The asset allocation is based on certain historical behaviour of Index and P/E. The future relationship may be different altogether.
- The rigid asset allocation framework undermines the stock selection and timing skills of fund manager.

Part C: Applied Theory

6. The following are popular approaches of asset allocations:

Popular Approach

In the words of a layman, asset allocation can be looked at as a decision on how to divide the income between current spending and investment, and how to distribute the investment among the various possible avenues to attain the targeted goals. The methods in this approach generally try to capture a part of the wisdom that professionals get through years of study and practice into some rules of thumb.

100 Minus Your Age Method

According to this method, the percentage of your total investment that can be invested in equities depends on your age and is based on the premise that you will live to be 100 years old. The method suggests that the proportion of investment to be placed in equities is 100 minus your age. The rest may be placed in bonds and other safe investments.

Your Age	100 Minus Your Age	% Investment in Equities	% Investment in Bonds
30	70	70	30
40	60	60	40
50	50	50	50
60	40	40	60

Though life expectancy is increasing, the probability of a person living beyond 100 is still low. As the age increase, the ability to take risk normally declines. This method essentially addresses this issue.

The person who uses this method reduces his allocation to equities as he/she grows old. This method, while based on the general perceptions about the desirable exposure to equities over the life of a person, suffers from some obvious defects. It does not take into account the life expectancy of a person, the factor of inflation, the wealth to be accumulated or the current financial needs. Over the years, this method results in increase in the current income and decrease in growth, which can be harmful for the financial condition of the person considering inflation and increasingly long life expectancies.

Financial Objectives Method

This method is based more on common sense than anything else. It simply says, plan your financial needs in future and invest enough money so that you will be able to realize them. It does not talk anything about how and where and when to invest. If your goals are short-term, invest in short-term liquid investments and if they are long term go for long-term investments. All that you have to know is what you want to achieve and how much you can save today for that.

Cash Flow Needs Method

This Method, as the name suggests, involves projecting the cash flows of the future and estimating the deficit if any. Investments will then be aimed at filling the deficit. The sources of income that a person may have, for example, may be wages and salary, pension payments, interest and dividend income on investments already made, rental income from properties, sale proceeds of properties, inheritance of property, sale of used vehicle, etc. The outflows expected in future should then be reduced from the inflows. If there is a surplus, then you may go for conservative or safe investments. In case there is a deficit, investments will have to be made aggressive and the degree of aggressiveness depends on the amount of deficit and the amount now available for investment.

Risk Tolerance Method

This method ignores the financials and focuses on the psychology of the individual. According to this method, a risk-averse person should invest all or most of the money available in low risk investments and a risk-lover may invest in high risk instruments.

100% Common Stocks for Long Run

This strategy involves placing all the long-term investments entirely in equity stocks. This method generally gets into popularity when stock markets are on a high and falls in popularity along with the markets. There is no other basis, scientific or otherwise, for it.

7. The following are the commonly seen misconceptions regarding risk:

Losses: Common individual investors generally look at risk as losing money. Such investors generally become aware of risk only after they make losses. Some are of the opinion that losses are incurred only when investments made are liquidated at prices below the purchase prices. They do not understand book losses and often stop their portfolio manager from realizing a loss even when the prices are falling. Being fully focused only on profits and losses, they tend to overlook the need to evaluate the performance of the portfolio (and that of the portfolio manager) in comparison with the performance of the market portfolio. A characteristic feature of individual investors is to hold to stocks that have lost value with the hope that they will some day rise, wiping out the losses. They generally ignore the time lag between the day the value of the stocks comes down and the day they recover it. Many investors also do not understand the difference between the potential for loss and actual loss. It is not uncommon to find them saying that a particular stock was not risky after all, and that the portfolio manager need not have bothered to switch out of it, while its standard deviation of return may be a high 25 percent based on historical data. The point sought to be made here is that they do not understand that a stock that has shown high volatility in the past need not necessarily show the same degree of volatility again and that the actions of the portfolio manager are generally aimed at avoiding the losses just in case it does.

Risk and Unfamiliarity: Individual investors generally tend to treat investments with which they are not fully familiar as being more risky. When the portfolio manager strongly suggests a switch from stocks of one sector to another (say from Pharma to FMCG), the investor is likely to resist if he is not familiar with FMCG stocks. Unfamiliarity with instruments such as stock index futures and options and a vague memory that these instruments have been responsible for great losses to big institutions may also result in the investor resisting any moves for hedging the portfolio.

Earlier Losses: Investors generally treat the investments in which they incurred losses earlier as being risky. If a person incurs losses by investing in aquaculture or granite stocks, he avoids stocks from these industries for the rest of his life, irrespective of their present performance. That is, the investor develops a severe fear or aversion towards the stock. Such psychological blocks can sometimes be removed by the portfolio manager by educating the investor about the real nature of investment risks.

Contrary Investing: Contrary investing or contrarian investing is a favorite of a significant number of portfolio managers. It involves buying a stock when everybody is selling (that is, when it is out of fancy with the market and its price is dropping sharply) and selling it when everyone else is buying (that is, when the stock catches the fancy of the market and its price shows a sharp appreciation). Individual investors generally prefer to go along with the market and want the portfolio manager to buy and sell along with the market. They feel insecure of being 'left out' when everybody else makes profits.