

Question Paper

Portfolio Management and Mutual Funds-I (251) : April 2007

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. A portfolio manager has residual risk of 3% and the number of years he needs to sustain his performance at 90% confidence of its significance is 8.63 years. His alpha value is

[< Answer >](#)

- (a) 0.50%
- (b) 0.79%
- (c) 1.23%
- (d) 1.68%
- (e) 1.86%.

2. As per Arbitrage Pricing Theory (APT), which is a multi factor model, the return on any asset i is given by

[< Answer >](#)

$$R_i = \alpha_{i0} + \beta_{i1} I_1 + \beta_{i2} I_2 + \beta_{i3} I_3 + \dots + \beta_{im} I_m + e_i$$

where the notations are in their standard use.

If the variance of asset returns is $360(\%)^2$ and the above equation explains 68% of the total variance, the variance of error term i.e. $\text{Var}(e_i)$ will be

- (a) Zero
- (b) $115.2(\%)^2$
- (c) $151.4(\%)^2$
- (d) $215.6(\%)^2$
- (e) $244.8(\%)^2$.

3. As described by Markowitz, which of the following portfolios cannot lie on the efficient frontier?

[< Answer >](#)

Portfolio	Expected Return (%)	Standard Deviation (%)
P	18	38
Q	10	23
R	14	18
S	8	12
T	5	6

- (a) P
- (b) Q
- (c) R
- (d) S
- (e) T.

4. As per Biellard, Biehl and Kaiser Five-Way model, which of the following type of investors are swayed too much by the trend and do not have any expertise or opinion about investments?

[< Answer >](#)

- (a) Individualists
- (b) Adventurers
- (c) Celebrities
- (d) Guardians
- (e) Straight Arrows.

5. If interest rate decreases, duration of a 25-year bond selling at a premium

[< Answer >](#)

- (a) Increases
- (b) Decreases
- (c) Decreases first, then increases
- (d) Increases first, then decreases
- (e) Remains the same.

6. The portfolio composition of Mr. Avinash is given below:

[< Answer >](#)

	Rs. in lakh
Equity	120
Cash/Cash equivalents	40
Total	160

The beta of the equity portion of the portfolio is 0.85 and the current Nifty futures is at 4261.5. The multiple attached to Nifty futures is 100. If Mr. Avinash purchases 23 futures contracts, his portfolio beta will be

- (a) 0.96
- (b) 1.05
- (c) 1.12
- (d) 1.20
- (e) 1.25.

7. Mr. Sodhan, a speculator bought a straddle at a strike price of Rs.95 on IDBI stock which is trading at Rs.95. He paid a total premium of Rs.8. The break-even prices for the speculator are

[< Answer >](#)

- (a) Rs.91 and Rs.99
- (b) Rs.89 and Rs.111
- (c) Rs.89 and Rs.103
- (d) Rs.87 and Rs.103
- (e) Rs.87 and Rs.111.

8. The maximum possible loss for a covered call writer is

[< Answer >](#)

- (a) Option premium
- (b) Current price of the underlying asset
- (c) Strike price
- (d) Infinite
- (e) Initial investment.

9. The NAV of each unit of a closed-end fund at the beginning of the year was Rs.14. By the year end, its NAV equals Rs.14.40. At the beginning of the year, each unit was selling at a 3% premium to NAV. By the end of the year, each unit is selling at a 5% discount to NAV. The fund paid year-end distributions of income and capital gains of Rs.2.40 on each unit. The rate of return to the investor in the fund during the year is

[< Answer >](#)

- (a) 10.125%
- (b) 10.826%
- (c) 11.512%
- (d) 11.962%
- (e) 12.124%.

10. There are two independent economic factors – growth rate and interest rate. The risk free rate is 6%. All stocks have independent firm specific components with a standard deviation of 25%. The following are well-diversified portfolios:

[< Answer >](#)

Portfolio	Beta on growth rate	Beta on interest rate	Required Return (%)
X	1.7	2.2	29
Y	2.4	-0.4	27

The expected return-beta relationship in this economy is

- (a) $R_p = R_f + 6.3 \beta_{F1} + 2.3 \beta_{F2}$
- (b) $R_p = R_f + 7.3 \beta_{F1} + 3.3 \beta_{F2}$
- (c) $R_p = R_f + 9.3 \beta_{F1} + 3.3 \beta_{F2}$
- (d) $R_p = R_f + 10.3 \beta_{F1} + 4.4 \beta_{F2}$
- (e) $R_p = R_f + 11.3 \beta_{F1} + 4.4 \beta_{F2}$

11. The relation between the return of a mutual fund and the return on market is given by

[< Answer >](#)

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

Where the notations are in their standard use.

If the value of c in the above equation is 0,

- I. The curve depicting the relationship between market return and portfolio return becomes steeper as value of r_m increases.
 - II. The fund manager has concentrated only on market timing.
 - III. The fund manager has concentrated only on stock selection.
- (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.

12. The standard deviation of the market returns is 26.32%. The covariance between returns of the stocks SBI and ICICI is 556.84(%)². If beta of stock of SBI is 1.1, beta of stock of ICICI is

[< Answer >](#)

- (a) 0.65
- (b) 0.73
- (c) 0.85
- (d) 0.96
- (e) 1.10.

13. Up to how many number of securities in a portfolio, the data requirement under Single Index model is more than or equal to that under Markowitz model?

[< Answer >](#)

- (a) 2
- (b) 3
- (c) 4
- (d) 5
- (e) 6.

14. Mr. Pradip is a Chartered Financial Analyst, working as a fund manager for Danial Mutual Fund. Every time he trades stock, he incurs 0.5% of the value of the trade towards commission and transaction cost. If the portfolio turnover rate is 75%, the total return of the portfolio is reduced due to trading costs by [< Answer >](#)
- (a) 0.125%
 - (b) 0.250%
 - (c) 0.350%
 - (d) 0.375%
 - (e) 0.500%.
15. 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.
16. If the average YTM of a bond portfolio decreases from 14.8% to 14.3%, the value of the portfolio increases by 2.83%. The approximate duration of the bond portfolio is [< Answer >](#)
- (a) 5.5 years
 - (b) 6.0 years
 - (c) 6.5 years
 - (d) 7.0 years
 - (e) 7.5 years.
17. Which of the following statements is/are **not true** with respect to Barnewall two-way model? [< Answer >](#)
- I. The risk averse nature of active investors generally results in their portfolios being too diversified and low-yielding.
 - II. Active investors are characterized by the confidence that losses can be made good sooner or later and the feeling that life need not necessarily be a bed of roses.
 - III. Passive investors generally do not have much knowledge of investments and are also aware of this fact.
- (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.
18. Based on their relative degrees of risk tolerance, [< Answer >](#)
- I. Investors will hold varying amounts of risky assets in their portfolios.
 - II. Investors will hold varying amounts of risk free assets in their portfolios.
 - III. All investors will have the same portfolio asset allocations.
- (a) Only (I) above
 - (b) Only (II) above
 - (c) Only (III) above
 - (d) Both (I) and (II) above
 - (e) Both (I) and (III) above.
19. A form of bond swap where an investor exchanges one bond for another to obtain a higher yield over the long-term, with little attention paid to the short-term outlook for the bond's perspective is called [< Answer >](#)
- (a) Substitution Swap
 - (b) Risk Neutral Swap
 - (c) Rate Anticipation Swap
 - (d) Risk Altering Swap
 - (e) Pure Yield Pickup Swap.

20. Mr. Sailesh is a fund manager of an equity fund which is expected to provide risk premium of 9% and standard deviation of returns of 16%. T-Bills are trading at 6.5% p.a. Mr. Prakash, a client of Mr. Sailesh, chooses to invest Rs.74,000 in equity fund and Rs.26,000 in T-Bills. The expected return and standard deviation of returns on the portfolio of Mr. Prakash is [< Answer >](#)
- (a) 12.42% and 10.12%
 - (b) 13.16% and 11.84%
 - (c) 13.16% and 12.42%
 - (d) 14.96% and 11.84%
 - (e) 14.96% and 12.42%.
21. Which of the following statements are **true** with respect to bond laddering strategy? [< Answer >](#)
- I. Bond laddering means buying bonds scheduled to mature at several different dates in the future, rather than all at the same time.
 - II. A bond laddering is an effective tool for some one who needs to ride the yield curve.
 - III. In bond laddering each group of bonds represents a rung on the investment maturity ladder.
 - IV. Bond laddering is an active bond management strategy.
- (a) Both (I) and (IV) above
 - (b) Both (I) and (III) above
 - (c) Both (II) and (IV) above
 - (d) Both (III) and (IV) above
 - (e) Both (II) and (III) above.
22. Which of the following techniques of measuring returns is most useful for open-ended mutual funds? [< Answer >](#)
- (a) Money weighted rate of return
 - (b) Time weighted rate of return
 - (c) Linked internal rate of return
 - (d) Average return
 - (e) Holding period return.
23. A 20 year zero coupon bond is newly issued with a yield to maturity of 8% and face value of Rs.10,000. The imputed interest income in the first year of the bond's life is [< Answer >](#)
- (a) Rs.136.42
 - (b) Rs.141.64
 - (c) Rs.157.12
 - (d) Rs.162.45
 - (e) Rs.171.64.
24. Which of the following statements is/are **true**? [< Answer >](#)
- I. Insured asset allocation switches mainly between stocks and treasury bills.
 - II. Insured asset allocation seeks more to suit short-term investors' objectives.
 - III. Insured asset allocation is based on the assumption that expected returns, risks and correlations constantly change over the period during which the insurance is in force.
- (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.

25. An investor is planning to choose between 2 year and 3 year maturity bonds, with YTM's of 8% and 9% respectively. The annual coupon payment on both the bonds is 9%. If his investment horizon is one year and he strongly believes that the yield curve will be flat at 9% at the end of the year, [< Answer >](#)

- I. He should invest in 2-year bond, since holding period return on bond is comparatively more at 10.2%.
- II. He should invest in 3-year bond, since holding period return on bond is comparatively more at 9%.
- 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.

26. 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.

27. Which of the following option strategies involve the purchase of call options and writing of put options at exactly the same exercise price? [< Answer >](#)

- (a) Synthetics
- (b) Conversions
- (c) Reversals
- (d) Corners
- (e) Spreads.

28. A bond that is traded without accrued interest is called [< Answer >](#)

- (a) Plain bond
- (b) Swallow bond
- (c) Deep bond
- (d) Flat bond
- (e) Rainbow bond.

29. At the prevailing environment, [< Answer >](#)

The CML equation for a portfolio i is given as

$$E(r_i)\% = 6.5 + 0.45 \sigma_i$$

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

$$E(r_i)\% = 6.5 + 6.7 \beta_i$$

Therefore, the market return and the standard deviation of market portfolio are respectively

- (a) 13.2% and 14.89%
- (b) 13.2% and 15.12%
- (c) 14.8% and 15.12%
- (d) 14.8% and 14.89%
- (e) Insufficient information.

30. The characteristics of Stocks A and B are as follows:

[< Answer >](#)

Stock	Expected Return (%)	Standard Deviation (%)
A	10	10
B	12	15

The correlation coefficient between the stocks A and B is -1 . If it is possible to borrow at the risk-free rate, the approximate risk-free rate is

- (a) 8.4%
- (b) 9.6%
- (c) 10.8%
- (d) 11.2%
- (e) 12.5%.

END OF SECTION A

Section B : Problems (50 Marks)

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

1. The 3-month futures contract on NSE Nifty maturing on 26/07/2007 is currently trading at 4152. The current value of the market index is 4058. The one-year risk free rate is 6.5% and the year end dividend yield on the market index is 4%. (All the stocks constituting the market index pay dividend during the three-month period).

[< Answer >](#)

You are **required** to

- a. Determine by how much is the futures contract mis-priced.
- b. Formulate a zero-net-investment arbitrage portfolio so that you can lock in risk-free profits equal to the futures mis-pricing. (Assume that no margin is required).

(2 + 3 = 5 marks)

2. Mr. Jain has zeroed in on the following stocks with the parameters given below:

[< Answer >](#)

Stock	Return (%)	Systematic risk (%) ²	Residual return (%) to residual risk (%)
Premier Ltd.	16	180	0.80
Quality Pharmaceuticals	15	110	0.80
Reliance Industries	19	362	1.60
Sonata Software	13	256	1.75
Tata Tea	14	220	2.10

The standard deviation of returns on market is 14%. Market risk premium is 7.5%. 364 day T-bills are trading at Rs.94.44 in the market.

You are **required** to construct an optimum portfolio using the Sharpe's optimization method.

(10 marks)

3. Consider the following portfolios:

[< Answer >](#)

Portfolio	Appraisal Ratio	Beta	Alpha (%)
A	1.0	1.3	1.5
B	0.4	0.8	0.9
C	0.6	2.1	2.5
D	1.6	1.8	2.0

Treynor's ratio and Sharpe ratio for market portfolio are 6.8 and 0.4 respectively. T-Bills are trading in the market at 6% p.a.

You are **required** to

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

(2 + 2 + 6 + 4 = 14 marks)

4. The yield to maturities of zero coupon bonds for different maturities are as follows:

[< Answer >](#)

Maturity in years	1	2	3	4	5	6	7	8
YTM (%)	7.2	7.4	7.7	8.0	8.3	8.5	8.7	9.0

The GOI is planning to issue the following coupon bonds to meet its requirements.

Bond	Face Value (Rs.)	Coupon Rate (%)	Maturity in years
GOI 2012	1,000	8.0	5
GOI 2015	1,000	8.5	8

You are **required** to

- Find out the prices at which both the bonds can currently sell in the market.
- Compute the prices at which both the bonds can sell next year, if the expectations theory of the yield curve holds good.
- Compute the prices at which both the bonds can sell next year, if the liquidity preference theory holds good and the liquidity premium is 0.75%.

(2 + 5 + 2 = 9 marks)

5. Consider the following information pertaining to three portfolios X, Y and Z:

[< Answer >](#)

Portfolio X		Portfolio Y		Portfolio Z	
Expected Return (%)	Probability (%)	Expected Return (%)	Probability (%)	Expected Return (%)	Probability (%)
8	35	8	12	8	6
10	28	9	26	11	19
12	21	10	26	13	24
15	15	11	24	15	36
16	1	12	12	17	15

You are **required** to determine

- Which of the above portfolios is preferable, if the utility function is $u(w) = w - w^{-4/7}$ (where w is expected return).
- Which of the above portfolios is preferable according to Roy's Safety First criterion, if the minimum level of return required is 12%.
- What is 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 25%.
- Which portfolio is preferred using geometric mean return.
- Which of the above portfolio is suitable to a moderate risk-averse investor whose risk tolerance level is 65%.

(2 + 2 + 2 + 2 + 4 = 12 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. Individuals can be defined in a variety of ways based on the level of their confidence, aggression, their attitude towards people, their sense of optimism or pessimism etc. When an individual decides to invest, he can be

[< Answer >](#)

either risk-prone and go in for investment in high tech stocks or he may be risk averse and choose a diversified portfolio. Explain various ways in which an individual investor can define risk.

(10 marks)

7. Discuss the factors considered in Risk Attribute Model developed by Solomon Brothers.

[< Answer >](#)

(10 marks)

END OF SECTION C

END OF QUESTION PAPER

Suggested Answers

Portfolio Management and Mutual Funds-I (251) : April 2007

Section A : Basic Concepts

1. Answer : (d) [< TOP >](#)
Reason: Number of years of the sustained performance = $(1.645/\text{information ratio})^2 = 8.63$ yrs.
Information ratio = 0.56
Information ratio = Residual Return (Alpha)/Residual Risk = 0.56
Alpha = $0.56 \times 3 = 1.68\%$.
2. Answer : (b) [< TOP >](#)
Reason : Variance (r_i) = Variance explained by the factor model + unexplained variance i.e., variance of error term
$$360 = 0.68 \times 360 + \text{Var}(e_i)$$
$$\text{Var}(e_i) = 360 - 0.68 \times 360 = 115.2 (\%)^2.$$
3. Answer : (b) [< TOP >](#)
Reason: The portfolio Q cannot lie on the efficient frontier because it is dominated by another portfolio. For example, portfolio R has higher expected return and lower standard deviation.
4. Answer : (c) [< TOP >](#)
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.
Straight Arrows: These are halfway between complete confidence and anxiety, and extreme carefulness and impetuosity.
5. Answer : (a) [< TOP >](#)
Reason : If interest rate decreases, the YTM of the bond selling at premium will also decrease. There is an inverse relationship between duration and YTM and therefore duration will increase.

6. Answer : (e) [< TOP >](#)
Reason : $120 \text{ lakh} \times 0.85 + 4,261.5 \times 100 \times 23 = 160 \text{ lakh} \times \text{Beta of portfolio}$
 $102 \text{ lakh} + 98.0145 \text{ lakh} = 160 \text{ lakh} \times \text{Beta of portfolio}$

$$\text{Beta of portfolio} = \frac{200.0145}{160} = 1.25.$$
7. Answer : (d) [< TOP >](#)
Reason : Straddle strategy involves buying a call option and a put option at the same exercise price and maturity. Higher break even price = Rs.95 + Rs.8 = Rs.103. Lower break even price = Rs.95 – Rs.8 = Rs.87.
8. Answer : (e) [< TOP >](#)
Reason : Covered call strategy involves buying a stock and also selling call on the same stock and therefore initial investment of covered call writer is equal to stock price + option premium received by selling call. If stock price turns out to zero, call will not be exercised and loss to covered call writer will be equal to his initial investment.
9. Answer : (c) [< TOP >](#)
Reason: The price of unit at the beginning of the year = Rs.14 × 1.03 = Rs.14.42
The price of unit at the end of the year = Rs.14.4 × 0.95 = 13.68
The price of the fund fell by – 0.74 (13.68–14.42)
Rate of return = $(2.4 - 0.74)/14.42 = 11.512\%$.
10. Answer : (c) [< TOP >](#)
Reason: $R_p = R_f + \beta_{F1} (R_{F1} - R_f) + \beta_{F2} (R_{F2} - R_f)$
 $29 = 6 + 1.7 RP_1 + 2.2 RP_2$
 $27 = 6 + 2.4 RP_1 + (-0.4) RP_2$
 $21 = 2.4 RP_1 - 0.4 RP_2$
 $RP_2 = (2.4 RP_1 - 21)/0.4$
 $23 = 1.7 RP_1 + 2.2 \times (2.4 RP_1 - 21)/0.4$
 $23 = 1.7 RP_1 + 13.2 RP_1 - 115.5$
 $RP_1 = 9.2953 \sim 9.3$
 $RP_2 = 2.4 \times 9.3 - 0.4 RP_2 = 21$
 $RP_2 = 3.30$
 $R_p = R_f + 9.3 \beta_{F1} + 3.30 \beta_{F2}.$
11. Answer : (b) [< TOP >](#)
Reason : When $c = 0$, the line represented by the equation will become a straight line. This shows that fund did not engage in market timing and concentrated only on stock selection as average beta of the portfolio is fairly constant. If c is positive, it indicates that the curve become steeper as one moves to the right of the diagram. Hence (III) is correct.
12. Answer : (b) [< TOP >](#)
Reason : According to the single index model

$$\begin{aligned} \text{Cov}(R_p, R_q) &= \beta_p \beta_q \sigma_m^2 \\ 556.84 &= 1.1 \times \beta_q \times (26.32)^2 \\ \beta_q &= 0.73. \end{aligned}$$

13. Answer : (c)

[< TOP >](#)

Reason : Data requirement under single index model = $3n + 2$

Data requirement under Markowitz model = $\frac{n(n+3)}{2}$

$$3n + 2 > \frac{n(n+3)}{2}$$
$$6n + 4 > n^2 + 3n$$
$$0 > n^2 - 3n - 4$$
$$n^2 - 3n - 4 < 0$$
$$n(n-4) + 1(n-4) < 0$$
$$(n-4)(n+1) < 0$$
$$n < 4, -1$$

n should be always less than (4).

14. Answer : (d)

[< TOP >](#)

Reason: Trading costs will reduce portfolio returns by $0.5 \times 0.75 = 0.375\%$

15. Answer : (b)

[< TOP >](#)

Reason: 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.

16. Answer : (c)

[< TOP >](#)

Reason : Change in YTM = $14.3 - 14.8 = -0.50\%$

$$\text{Change in the value of bond portfolio} = \left(\frac{-D}{1.148} \right) \times (-0.50) = +2.83\%$$
$$\text{Duration} = 6.49768 \sim 6.5 \text{ years.}$$

17. Answer : (a)

[< TOP >](#)

Reason: The risk averse nature of passive investors not active investors generally results in their portfolios being too diversified and low-yielding. Active investors are characterized by the confidence that losses can be made good sooner or later and the feeling that life need not necessarily be a bed of roses. Passive investors generally do not have much knowledge of investments and are also aware of this fact.

18. Answer : (d)

[< TOP >](#)

Reason : Statement (III) is incorrect as degree of risk tolerance does affect the weightage of risk free assets and risky assets in their portfolios.

19. Answer : (e)

[< TOP >](#)

Reason: A form of bond swap where an investor exchanges bonds that are expected to perform relatively poor for those that are expected to perform relatively well, given an anticipated movement in interest rates is called Pure Yield Pickup Swap.

20. Answer : (b) [< TOP >](#)
Reason: Expected return on equity fund = $6.5 + 9 = 15.5\%$
Expected return on the portfolio of Mr.Prakash = $0.74 \times 15.5 + 0.26 \times 6.5 = 13.16\%$
Expected standard deviation of the returns on portfolio = $0.74 \times 16 = 11.84\%$
21. Answer : (b) [< TOP >](#)
Reason: Bond laddering is a passive bond management strategy where the purpose is to match the assets with liability in the terms of maturity. Here the effort is not made to take advantage of change in yield curve.
22. Answer : (c) [< TOP >](#)
Reason: Money weighted rate of return is not a useful technique for open-ended mutual funds as this technique is dependent on the timing of cash flows and in case of open ended mutual funds there are frequent cash flows. Time weighted rate of return method is also dependent on the intermediate cash flows. Linked internal rate of return method tries to overcome the disadvantages of these methods by calculating periodic rates of return and linking them to calculate the equivalent rate of return for the entire holding period. Hence the correct answer is (c).
23. Answer : (e) [< TOP >](#)
Reason: The current price of the bond = $10,000/1.08^{20} = \text{Rs.}2,145.48$
The price of the bond after one year = $10,000/1.08^{19} = \text{Rs.}2317.12$
The imputed interest = $\text{Rs.}2317.12 - \text{Rs.}2,145.48 = \text{Rs.}171.64$.
24. Answer : (a) [< TOP >](#)
Reason: Insured asset allocation switches mainly between stocks and treasury bills. Insured asset allocation seeks more to suit long-term investors. Insured asset allocation is based on the assumption that expected returns, risks and correlations remain the same over the period during which the insurance is in force.
25. Answer : (b) [< TOP >](#)
Reason: The investor is planning to choose between 2 year and 3 year maturity bonds which yield 8% and 9% respectively. The annual coupon payment on both the bonds is 9%. If you strongly believe that at year end, the yield curve will be flat at 9%,
Let the face of value of the bonds be Rs.1000
Current price of two year bond = $90 \text{ PVIFA } (8\%, 2) + 1000 \text{ PVIF } (8\%, 2) = \text{Rs.}1017.83$
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 = $[(1000 - 1017.83) + 90] / 1017.83 = 72.17 / 1017.83 = 7.09\%$
Return on three year bond = $[(1000 - 1000) + 90] / 1000 = 9\%$

26. Answer : (d) [< TOP >](#)

Reason: Variance/Covariance method is based on Modern Portfolio Theory.
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.

27. Answer : (a) [< TOP >](#)

Reason: Synthetics involve the purchase of call options and writing of put options at exactly the same exercise price.

28. Answer : (d) [< TOP >](#)

Reason: A bond that is traded with out accrued interest is flat bond.

29. Answer : (a) [< TOP >](#)

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 $E(R_i) = R_f + (R_m - R_f) \beta_i$

$$\frac{R_m - R_f}{\sigma_m} = 0.45$$

Therefore, $(R_m - R_f) = 6.7$

From the above equations, $\sigma_m = (6.7/0.45) = 14.89\%$
 $R_m = 6.7 + 6.5 = 13.2\%$.

30. Answer : (c) [< TOP >](#)

Reason: Since A and B are perfectly negatively correlated, a risk-free portfolio can be created and its rate of return in equilibrium will be the risk-free rate. With perfect negative correlation, the portfolio standard deviation reduces to

$$\sigma_P = [W_A \sigma_A - W_B \sigma_B]$$
$$0 = 10W_A - 15(1 - W_A)$$
$$W_A = 0.6$$

The expected rate of return on the risk free portfolio
 $0.6 \times 10 + 0.4 \times 12 = 10.8\%$.

Section B : Problems

1. The 3-month futures contract on NSE Nifty maturing on 26/07/2007 is currently trading at 4152. The current value of the market index is 4058. The one-year risk free rate is 6.5% and the year end dividend yield on the market index is 4%. (All the stocks constituting the market index pay dividend during the three-month period).

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- a. Annual risk free rate = 6.5%

∴ Quarterly risk free rate = 1.625%

Fair price of the futures contract

$$= 4058 \times (1 + 0.01625) - 162.32$$

$$= 4123.9425 - 162.32$$

$$= 3961.6225$$

Actual price of the 3-month futures contract is 4152. So, the futures contract is 190.3775 above the proper level.

- b. Sell the relatively cheap futures and Buy the relatively expensive index

	Cash Flow Now	Cash Flow after 3 months
Buy Index	- 4058	+ (S _T + 162.32)
Sell Futures	0	4152 - S _T
Borrow Rs.4058 @ 6.5% p.a	+ 4058	- 4123.9425
For three months	0	190.3775

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Stock	Return (%)	Systematic Risk (%) ²	$\beta^2 =$ (Systematic Risk/ Market Variance)	β	Required Return (%) = $R_f +$ $\beta (R_m -$ $R_f)$	Alpha (%) (Residual Return) = Return - Required Return	Residual Risk (%)	Residual Risk ² (%) ²	Excess Return to Beta
Premier	16	180	0.92	0.96	13.1	2.9	3.625	13.14	10.52
Quality	15	110	0.56	0.75	11.525	3.475	4.34375	18.87	12.13
Reliance	19	362	1.847	1.36	16.1	2.9	1.8125	3.285	9.63
Sonata	13	256	1.306	1.14	14.45	-1.45	0.8286	0.6866	6.23
Tata tea	14	220	1.122	1.06	13.85	0.15	0.07	0.005	7.64

Yield on 364 day T-bills = $[(100/94.44) - 1] \times 365/364 \times 100 = 5.9\%$.

Stock	$(R_i - R_f)/\beta$	$(R_i - R_f) \times \beta$	$[(R_i - R_f) \times \beta] / e_i^2$	β^2 / e_i^2	$\sum \frac{(R_i - R_f) \beta_i}{\sigma_{ei}^2}$	$\sum \frac{\beta_i^2}{\sigma_{ei}^2}$	$C_i = \frac{\sigma_m^2 \sum \frac{(R_i - R_f) \beta}{\sigma_{ei}^2}}{1 + \sigma_m^2 \sum \frac{\beta_i^2}{\sigma_{ei}^2}}$
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Quality	12.13	6.825	0.362	0.03	0.362	0.03	10.31
Premier	10.52	9.696	0.738	0.07	1.1	0.10	10.47
Reliance	9.63	17.82	5.425	0.56	6.525	0.66	9.81
Tata tea	7.64	8.59	1718	224.4	1724.525	225.06	7.66
Sonata	6.23	8.09	11.783	1.90	1736.308	226.96	7.65

$$Z_i = \frac{\beta_i}{\sigma_{ei}^2} \left(\frac{R_i - R_f}{\beta_i} - C^* \right)$$

$$Z_Q = \frac{0.75}{18.87} (12.13 - 10.47) = 0.065978$$

$$Z_P = \frac{0.96}{13.14} (10.52 - 10.47) = 0.003653$$

$$Z_i = 0.065978 + 0.003653 = 0.069631$$

$$\% \text{ Quality} = \frac{0.065978}{0.069631} = 0.9475 = 94.75\%$$

$$\% \text{ Premier} = \frac{0.003653}{0.069631} = 0.0525 = 5.25\%$$

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

As β_M of market portfolio is 1

$$\text{Market Risk Premium } (R_M - R_F) = 6.8\%$$

$$\text{Total Return} = \text{Alpha} + R_f + \text{Beta } (R_m - R_f)$$

$$\text{Portfolio A} = 1.5 + 6 + 1.3 \times 6.8 = 16.34\%$$

$$\text{Portfolio B} = 0.9 + 6 + 0.8 \times 6.8 = 12.34\%$$

$$\text{Portfolio C} = 2.5 + 6 + 2.1 \times 6.8 = 22.78\%$$

$$\text{Portfolio D} = 2 + 6 + 1.8 \times 6.8 = 20.24\%$$

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

$$\text{Portfolio A} = (16.34 - 6) / 1.3 = 7.9538$$

$$\text{Portfolio B} = (12.34 - 6) / 0.8 = 7.925$$

$$\text{Portfolio C} = (22.78 - 6) / 2.1 = 7.99$$

$$\text{Portfolio D} = (20.24 - 6) / 1.8 = 7.91$$

c. Appraisal ratio = Alpha / Residual Risk

$$\text{Residual risk} = \text{Alpha} / \text{Appraisal ratio}$$

$$\text{Portfolio A} = 1.5 / 1 = 1.5\%$$

$$\text{Portfolio B} = 0.9 / 0.4 = 2.25\%$$

$$\text{Portfolio C} = 2.5 / 0.6 = 4.17\%$$

$$\text{Portfolio D} = 2 / 1.6 = 1.25\%$$

$$\text{Residual risk}^2$$

$$\text{Portfolio A} = 2.25(\%)^2$$

$$\text{Portfolio B} = 5.0625(\%)^2$$

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$$\text{Portfolio C} = 17.3889(\%)^2$$

$$\text{Portfolio D} = 1.5625(\%)^2$$

$$\text{Sharpe's ratio of market portfolio} = (R_M - R_F)/\sigma_M = 0.4$$

$$\sigma_M = 6.8/0.4 = 17\%$$

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

$$\text{Portfolio A} = 1.3^2 \times 17^2 = 488.41(\%)^2$$

$$\text{Portfolio B} = 0.8^2 \times 17^2 = 184.96(\%)^2$$

$$\text{Portfolio C} = 2.1^2 \times 17^2 = 1274.49(\%)^2$$

$$\text{Portfolio D} = 1.8^2 \times 17^2 = 936.36(\%)^2$$

$$\text{Total risk} = \text{Residual Risk} + \text{Systematic risk}$$

$$\text{Portfolio A} = 2.25 + 488.41 = 490.66(\%)^2 \quad \text{S.D} = 22.15(\%)$$

$$\text{Portfolio B} = 5.0625 + 184.96 = 190.0225(\%)^2 \quad \text{S.D} = 13.785(\%)$$

$$\text{Portfolio C} = 17.3889 + 1274.49 = 1291.8789(\%)^2 \quad \text{S.D} = 35.94(\%)$$

$$\text{Portfolio D} = 1.5625 + 936.36 = 937.9225(\%)^2 \quad \text{S.D} = 30.6255(\%)$$

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

$$\text{Portfolio A} = (16.34 - 6)/22.15 = 0.4668\%$$

$$\text{Portfolio B} = (12.34 - 6)/13.785 = 0.4599\%$$

$$\text{Portfolio C} = (22.78 - 6)/35.94 = 0.4669\%$$

$$\text{Portfolio D} = (20.24 - 6)/30.6255 = 0.465\%$$

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

$$\text{Portfolio A} = 16.34 - [6 + (6.8)22.15/17] = 1.48\%$$

$$\text{Portfolio B} = 12.34 - [6 + (6.8)13.785/17] = 0.826\%$$

$$\text{Portfolio C} = 22.78 - [6 + (6.8)35.94/17] = 2.404\%$$

$$\text{Portfolio D} = 20.24 - [6 + (6.8)30.6255/17] = 1.9898\%$$

$$\text{Return due to extra diversifiable risk} = \text{Return from total selectivity} - \text{Return from net selectivity}$$

$$\text{Portfolio A} = 1.5 - 1.48 = 0.025\%$$

$$\text{Portfolio B} = 0.9 - 0.826 = 0.074\%$$

$$\text{Portfolio C} = 2.5 - 2.404 = 0.096\%$$

$$\text{Portfolio D} = 2.0 - 1.9898 = 0.0102\%$$

4. a. The price of GOI2012 bond = $80/(1.072) + 80/(1.074)^2 + 80/(1.077)^3 + 80/(1.08)^4 + 1080/(1.083)^5 = \text{Rs.991.73}$

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$$\text{The price of GOI2015 bond} = 85/(1.072) + 85/(1.074)^2 + 85/(1.077)^3 + 85/(1.08)^4 + 85/(1.083)^5 + 85/(1.085)^6 + 85/(1.087)^7 + 1085/(1.09)^8 = \text{Rs.984.58}$$

b. Forward rates

$$= r_1 = 7.2\% \text{ and } r_2 = 7.4\%, r_{12} = (1.074^2/1.072) - 1 = 7.6\%$$

$$= r_1 = 7.2\% \text{ and } r_3 = 7.7\%, r_{13} = (1.077^3/1.072)^{1/2} - 1 = 7.95\%$$

$$= r_1 = 7.2\% \text{ and } r_4 = 8.0\%, r_{14} = (1.08^4/1.072)^{1/3} - 1 = 8.27\%$$

$$= r_1 = 7.2\% \text{ and } r_5 = 8.3\%, r_{15} = (1.083^5/1.072)^{1/4} - 1 = 8.58\%$$

$$= r_1 = 7.2\% \text{ and } r_6 = 8.5\%, r_{16} = (1.085^6/1.072)^{1/5} - 1 = 8.76\%$$

$$= r_1 = 7.2 \text{ and } r_7 = 8.7\%, r_{17} = (1.087^7/1.072)^{1/6} - 1 = 8.95\%$$

$$= r_1 = 7.2 \text{ and } r_8 = 9\%, r_{18} = (1.09^8/1.072)^{1/7} - 1 = 9.26\%$$

$$\text{Price of GOI2012 bond} = 80/(1.076) + 80/(1.0795)^2 + 80/(1.0827)^3 + 1080/(1.0858)^4 = \text{Rs.983.04}$$

$$\text{Price of GOI2015 bond} = 85/(1.076) + 85/(1.0795)^2 + 85/(1.0827)^3 + 85/(1.0858)^4 + 85/(1.0876)^5 + 85/(1.0895)^6 + 1085/(1.0926)^7 = \text{Rs.970.46}$$

c. Price of GOI2012 bond = $80/(1.0685) + 80/(1.072)^2 + 80/(1.0752)^3 + 1080/(1.0783)^4 = \text{Rs.1007.7}$

$$\text{Price of GOI2015 bond} = 85/(1.0685) + 85/(1.072)^2 + 85/(1.0752)^3 + 85/(1.0783)^4 + 85/(1.0801)^5 + 85/(1.082)^6 + 1085/(1.0851)^7 = \text{Rs.1,008.12}$$

5. a. $u(w) = w - w^{-4/7}$

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Outcome (%)	Utility	Outcome (%)	Utility	Outcome (%)	Utility
8	7.695	8	7.695	8	7.695
10	9.732	9	8.715	11	10.746
12	11.758	10	9.732	13	12.769
15	14.787	11	10.746	15	14.787
16	15.795	12	11.758	17	16.802

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

$$\begin{aligned} X &= 7.695 \times 0.35 + 9.732 \times 0.28 + 11.758 \times 0.21 + 14.787 \times 0.15 + 15.795 \times 0.01 \\ &= 10.26339\% \sim 10.26\% \end{aligned}$$

$$\begin{aligned} Y &= 7.695 \times 0.12 + 8.715 \times 0.26 + 9.732 \times 0.26 + 10.746 \times 0.24 + 11.758 \times 0.12 \\ &= 9.70962\% \sim 9.71\% \end{aligned}$$

$$\begin{aligned} Z &= 7.695 \times 0.06 + 10.746 \times 0.19 + 0.24 \times 12.769 + 14.787 \times 0.36 + 16.802 \times 0.15 \\ &= 13.41162\% \sim 13.41\% \end{aligned}$$

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

- b. Probability of getting a return less than 12% from each of investment alternative can be calculated as follows:

$$X = 0.35 + 0.28 = 0.63$$

$$Y = 0.12 + 0.26 + 0.26 + 0.24 = 0.88$$

$$Z = 0.06 + 0.19 = 0.25$$

As the probability of getting return less than 12% is lowest for investment Z, 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		
	X	Y	Z
8	0	0	0
9	35%	12%	6%
10	35%	38%	6%
11	63%	64%	6%
12	63%	88%	25%

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 Z has given a maximum return of 12% at which probability of getting a return lesser than 12% is just 25%. Therefore, investment Z is preferable.

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

$$\begin{aligned} X &= [(1.08)^{0.35} \times (1.1)^{0.28} \times (1.12)^{0.21} \times (1.15)^{0.15} \times (1.16)^{0.01}] - 1 \\ &= 10.50\% \end{aligned}$$

$$\begin{aligned} Y &= [(1.08)^{0.12} \times (1.09)^{0.26} \times (1.1)^{0.26} \times (1.11)^{0.24} \times (1.12)^{0.12}] - 1 \\ &= 9.97\% \end{aligned}$$

$$Z = [(1.08)^{0.06} \times (1.11)^{0.19} \times (1.13)^{0.24} \times (1.15)^{0.36} \times (1.17)^{0.15}] - 1$$

$$= 13.61\%$$

Investment Z is preferable as the geometric mean return is highest.

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

$$\text{Expected utility} = \text{Return} - \frac{\text{Variance}}{\text{Risk tolerance}}$$

Investment X

$$\text{Expected return} = 8 \times 0.35 + 10 \times 0.28 + 12 \times 0.21 + 15 \times 0.15 + 16 \times 0.01 = 10.53\%$$

$$\text{Variance of return} = [(8 - 10.53)^2 \times 0.35 + (10 - 10.53)^2 \times 0.28 + (12 - 10.53)^2 \times 0.21 + (15 - 10.53)^2 \times 0.15 + (16 - 10.53)^2 \times 0.01] = 6.0691(\%)^2$$

$$\text{Expected utility} = 10.53 - \frac{6.0691}{65} = 10.4366\% \sim 10.44\%$$

Investment Y

$$\text{Expected return} = 8 \times 0.12 + 9 \times 0.26 + 10 \times 0.26 + 11 \times 0.24 + 12 \times 0.12 = 9.98\%$$

$$\text{Variance of return} = [(8 - 9.98)^2 \times 0.12 + (9 - 9.98)^2 \times 0.26 + (10 - 9.98)^2 \times 0.26 + (11 - 9.98)^2 \times 0.24 + (12 - 9.98)^2 \times 0.12] = 1.4596(\%)^2$$

$$\text{Expected utility} = 9.98 - \frac{1.4596}{65} = 9.958\% \sim 9.96\%$$

Investment Z

$$\text{Expected return} = 8 \times 0.06 + 11 \times 0.19 + 13 \times 0.24 + 15 \times 0.36 + 17 \times 0.15 = 13.64\%$$

$$\text{S.D. of return} = [(8 - 13.64)^2 \times 0.06 + (11 - 13.64)^2 \times 0.19 + (13 - 13.64)^2 \times 0.24 + (15 - 13.64)^2 \times 0.36 + (17 - 13.64)^2 \times 0.15] = 5.6904\%$$

$$\text{Expected utility} = 13.64 - \frac{5.6904}{65} = 13.55\%$$

As the expected utility for investment Z is highest, it is suitable for the moderately risk averse investor.

Section C: Applied Theory

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

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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.

7. In the RAM model of Solomon Brothers, the following six macroeconomic factors are used:

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Economic growth: The monthly change in industrial production is used, which is measured concurrently with stock returns.

Business cycle: The factor representing the stage of the business cycle is taken as the difference between the yield on top rated corporate bonds of a 20-year maturity and the 20-year Treasury bonds. The spread between the two falls during economic booms and rises during economic recessions.

Long-term interest rates: The change in the ten-year Treasury yields is taken. This represents the change in relative attractiveness of the financial assets and may cause investors to change the portfolio mix.

Short-term interest rates: The change in the 1-month Treasury bill rate is taken.

Inflation shock: The difference between the expected inflation and the actual inflation is taken. The expected inflation is estimated based on another model developed by the proponents of this model.

Value of the currency: The change in value of the domestic currency is taken, as measured by a trade-weighted basket of currencies.

Apart from these six main factors, there is another factor considered. It is a residual factor, called 'residual market beta' by the proponents of this model. The factor is intended to capture the other macroeconomic factors remaining after considering the above six.

Identification of the factors

The first step for estimating the parameters for the RAM model of Solomon Brothers is to run multiple regression for each stock of the universe being considered. The dependent variable for the regression is the stock return and the independent variables are the above six factors, the residual market beta and other market factors. The statistical significance of each of the factors is studied. Then, for all the stocks in the universe being considered, the factors are standardized.

Standardization involves finding the average and the standard deviation of each of the factors, then calculating the difference between the values of the factors obtained from the regression and the average, and finally dividing the difference with the standard deviation. From the standardized values thus obtained, value lesser than -5 and greater than +5 are rejected. This results in values that are too wide away from the mean being rejected.

The standardized multiple regression coefficient of a stock is then taken as the sensitivity of that stock to that macroeconomic factor. If the value of the regression coefficient of a stock for one of the factors is zero, it means that the stock has average sensitivity to that factor. Deviations from zero indicate higher sensitivity to that factor. For example, let us say that a stock has a positive value for change in the value of the domestic currency. It means that, all other things remaining constant, the stock will provide better returns than the market if the value of the domestic currency increases. Similarly, a negative value indicates that, all other things remaining the same, the stock will under perform the market.

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