

Question Paper

Security Analysis – I : January 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 equity shares of Escorts are presently trading at Rs.58.15 (face value Rs.10). The P/E ratio of the company's share is 20.1. The last dividend declared is 20%. The duration of the equity share is
 - a. 20 year
 - b. 24 year
 - c. 29 year
 - d. 32 year
 - e. Data not sufficient.
2. An investor wants to invest in corporate bonds and at the same time want to limit his interest rate risk and default risk. Which of the following possible bonds would you recommend him to purchase?
 - a. BBB perpetual bond
 - b. AAA bond with 15 years to maturity
 - c. BBB bond with 10 years to maturity
 - d. AAA bond with 10 years to maturity
 - e. BBB bond with 15 years to maturity.
3. If investors conclude that the inflation rate is going to rise, then which of following is most likely take place?
 - a. The beta would increase
 - b. The slope of the SML would decrease
 - c. The required return on an average stock would increase
 - d. The market risk premium would increase
 - e. The beta would decrease.
4. If the credit rating of an ordinary plain vanilla bond is downgraded, then in which of the following ways would the bond respond?
 - a. The bond's market price rises
 - b. The bond's indenture contract is revised
 - c. The bond's coupon rate falls
 - d. The bond's yield to maturity rises
 - e. The bond's yield to maturity falls.
5. Which of the following types of investments experience the least interest rate risk?
 - a. Zero coupon bonds
 - b. Long term government bonds
 - c. Preferred stock
 - d. Long term corporate bonds
 - e. Short term treasury bills.

6. Which of the following statement(s) is/are **true**?
- I. YTM depends upon interest income as well as the expected capital gains on maturity
 - II. The closer a bond is to maturity, the less sensitive the price of the bond is to interest rate changes
 - III. Callable debt is debt that may be paid off early.
- a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (III) above
 - e. All (I), (II) and (III) of the above.
7. An in-the-money call option is one that
- I. Has an exercise price below the current market price of the underlying security
 - II. Has positive value if buyer exercises it
 - III. Has an exercise price above the current market price of the underlying security.
- a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (II) and (III) above.
8. The writer of a put option on stock has
- a. The choice to deliver the shares or take cash payoff
 - b. The choice of offset with buying a call option
 - c. The obligation to deliver the shares at exercise price
 - d. The obligation to buy the shares at exercise price
 - e. The choice of exercising the put or not.
9. Which of the following statements is **true** of the constant growth Dividend Discount Model?
- I. It assumes that each future dividend is $(1 + g)$ times greater than the prior dividend
 - II. Assumes that the discount rate is greater than the growth rate
 - III. Assumes that the increase in growth rate is constant over time
- a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (I) and (III) above.
10. Which of the following statement(s) is/are **true** concerning all the three forms of the efficient market hypothesis?
- I. Equilibrium rate of return will prevail
 - II. Securities of firms sell at their fair value
 - III. Investors cannot earn a positive return
- a. Only (I) above
 - b. Only (II) above
 - c. Both (I) and (III) above
 - d. Both (I) and (II) above
 - e. All of (I), (II) and (III) above.

11. Which of the following scrips is **not** included, at present, in the 30 scrips of the Sensex?

- a. MTNL
- b. BHEL
- c. ITC
- d. Nestle India
- e. ABB.

12. The organization of stock exchanges in India is in the form of

- a. Public Limited Company
- b. Company limited by guarantee
- c. Voluntary non-profit making organisation
- d. All of the above.
- e. Both (b) and (c) above

13. Consider the following data:

Ratios	2000	2001
PBT/NS	13.50	13.25
PAT/PBT	0.87	0.73
NS/TA	1.73	1.82
TA/NW	2.75	2.95
ROE%	55.88	51.93

The fall in ROE has taken place in 2001 primarily due to

- a. Fall in profit margin
- b. Increase in leverage
- c. Fall in tax efficiency
- d. Increase in asset turn over
- e. Both (a) and (b) above.

14. The market value of the shares of NIFTY Index on a day is Rs.287190.47 crore. In the base year the aggregate market value of Index was Rs.269.16 crore. The market value of shares of a company which has been amongst the 50 shares since beginning increases by Rs.1240 crore due to recent rights issue. The revised value of base year market capitalization is

- a. Rs. 266.86 crore
- b. Rs. 268.00 crore
- c. Rs. 270.32 crore
- d. Rs. 272.56 crore
- e. Rs.1509.16 crore.

15. Which of the following statement(s) is/are **true** as per fundamental analysis and assumptions of constant growth dividend capitalization model?

- a. A stock that sells for less than book value is undervalued
- b. If a company's return to equity drops, its price/book value ratio will drop more than proportionately
- c. A combination of a low price/book value ratio and a high expected return on equity suggests that a stock is undervalued
- d. Other things remaining equal, a higher growth stock will have a lower price/book value ratio than a lower growth stock
- e. Both (b) and (c) above.

16. Which of the following would you consider the best indicator of an undervalued firm?

- a. A firm with a P/E ratio lower than the industry P/E
- b. A firm with a P/E ratio lower than the average P/E ratio for the firm's peer group
- c. A firm with a P/E ratio lower than its peer group and a lower expected growth rate
- d. A firm with a lower P/E ratio than its peer group, a higher expected growth rate and lower risk
- e. A firm with a lower P/E ratio than its peer group, a lower expected growth rate and lower risk.

17. Which of the following statement(s) is **false**?
- Penetration of a steep trend line generally results in a corrective movement after which the previous trend continues
 - The higher the volume accompanying the confirmation of a support or resistance level, the more its significance
 - Support and resistance tends to repeat their effectiveness time and again
 - A moving average represents a smoothened trend and therefore also acts as a support/resistance line
 - When the moving average line is flat and the price line falls below it a reversal in bearish trend is signaled.
18. Which of the following statements is **true**?
- The significance of a pattern is an indirect function of its size and depth
 - The longer it takes for prices to move out of the pattern, the weaker is the base of the new trend
 - Price patterns offer certain forecasting possibilities because the duration of trend can be measured on the price chart
 - A valid breakout can be confirmed in most cases, if the penetration of the boundaries of a pattern are marked by price change more than 5% only
 - The validity of a breakout should be confirmed by momentum indicator.
19. The beta of stock A is 2.0 and is currently in equilibrium. The required return on the stock is 15% and the expected return on the market is 10%. Suddenly due to economic conditions, the expected return on the market increases to 15%. Other things remaining the same what would be new required return on the stock?
- 17.5%
 - 20.0%
 - 22.5%
 - 25.0%
 - 30.0%
20. Company B has just paid a dividend of Rs.4.50. These dividends are expected to grow at a rate of 5% in the foreseeable future. The risk of this company suggests that future cash flows should be discounted at a rate of 9%. The intrinsic value of stock is approximately
- Rs. 50
 - Rs. 90
 - Rs.113
 - Rs.118
 - Rs.123
21. A par value bond with a face value of Rs.1000 matures in 2 years and has a 10% coupon to be paid at the end of each year. The current price of the bond is Rs.950. The YTM of this bond is
- 8.75%
 - 10.80%
 - 11.50%
 - 13.00%
 - 13.50%
22. The market rate of interest on 2 years bond is 9.75% while the rate on one year bond is 9.25%. The forward rate on a one year bond one year from now is 9.5%. The liquidity premium to induce investors to hold the 2 year bond is
- 0.25%
 - 0.38%
 - 0.75%
 - 1.20%
 - 2.25%

23. What will be the capital gains for a 5 year 7% annual coupon bond of face value Rs.1,000 if interest rates go down from 9% to 7%?
- Rs.74.21
 - Rs.77.79
 - Rs.84.22
 - Rs.90.16
 - Rs.91.16
24. A portfolio has 40% of its funds invested in security A and 60% of its funds invested in security B. Security A has a standard deviation of 10% and security B has a standard deviation of 15%. The securities have a coefficient of correlation of 0.5. Which of the following values is closest to portfolio variance?
- $43(\%)^2$
 - $79(\%)^2$
 - $133(\%)^2$
 - $1639(\%)^2$
 - One must have covariance to calculate expected value.
25. In a period of rising prices and stable inventory quantities, compared to a company that uses FIFO inventory valuation methods, a company using LIFO is likely to have which of the following characteristics?
- Higher net income
 - Higher current assets
 - Higher cost of goods sold
 - Higher cash flow from operations
 - None of the above.
26. Which of the following reduces assets and stockholder's equity?
- Stock splits
 - Cash dividends
 - Stock dividends
 - Reverse stock splits
 - Bonus issues.
27. The SML relates
- Expected return to standard deviation
 - Expected return of securities to expected return of portfolios
 - Efficient set of portfolios to risk-free rate
 - Expected return to beta
 - Standard deviations to risk.
28. A convertible bond of the face value Rs.1,000 had been issued at Rs.1,200 with a coupon rate of 10%. The conversion rate is 20 shares per bond. The current market price of the bond is 1300 and that of stock is Rs.55. The premium over conversion value is
- 9.09%
 - 18.18%
 - 20.00%
 - 23.15%
 - 30.00%.

29. Which of the following is/are characteristic(s) of Gambling?
- It is largely a matter of luck
 - The payoff is always non-linear
 - The risk and return are disproportionate.
- Only (I) above
 - Only (II) above
 - Only (III) above
 - Both (I) and (II) above
 - Both (I) and (III) above.
30. The qualitative factors affecting the value of real assets may be classified into macro and micro factors. Which of the following is a micro factor?
- Interest Rates
 - Demography
 - Business cycle
 - Location
 - None of the above.

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 given data on three similar properties

Property	Rental Value (Rs.)	Electricity Charges (Rs.)	Water charges (Rs.)
A	5,000	460	200
B	4,750	510	150
C	5,175	525	180

The market value of these properties are Rs.9.0 lakh, Rs.9.25 lakhs and Rs.9.50 lakhs respectively. Assume that electricity and water charges are not expected to vary greatly from above values.

You are **required** to calculate the capitalization rate.

(6 points)

2. Dharmesh Pharmaceuticals Ltd. have recently come out with a partly convertible debentures (PCDs) to part finance its Rs.20 crore capacity expansion programme. As per the terms of this issue, 12% PCDs of Rs.200 each will be issued at par. The convertible part of the debenture (Part A) of Rs.100 will be converted into 2 equity shares of face value Rs.10 after 18 months from the date of allotment. The non convertible part (Part B) of Rs.100 will be redeemed after 7 years. Interest will be paid semi annually.

The following additional information, and projections are available about the company:

	March, 2000	March, 2001	March, 2002	March, 2003
EPS (Rs.)	3.50	3.00	3.25	3.40
BONUS (Ratio)		1:3		

Month	Jan., 2003	Apr., 2003	July, 2003	Sep., 2003	Dec., 2003
Average P/E Ratio	15	14.8	14.5	14.0	13.8

Rakesh, an investor requires a rate of return of 14% p.a. compounded semi-annually.

You are **required** to advise Rakesh whether he should subscribe to the issue.

(12 points)

3. A bond issued by ABC Co. is selling presently at the face value of Rs.100 and pays coupon at the rate of 10% p.a. in arrears and will be redeemed at Rs.110 after 3 years.

- a. The n year spot rate of interest, y_n , is given by $y_n(\%) = 9.0 + \frac{n}{10}$ for $n = 1, 2$ and 3 .

Assuming the pure expectations theory holds good calculate

- The implied one year forward rates applicable at times $t = 1$ and $t = 2$
 - The value of the bond at time $t = 0$
- b. Assuming the term structure of interest rates is flat calculate
- The duration of the above bond
 - Change in bond price for 50 basis point increase in interest rate

(6 + 6 = 12 points)

4. The closing value of the Sensex for the month of October 2001 is given as below:

Date	Closing Sensex value
1/10/01	2795.30
3/10/01	2754.95
4/10/01	2788.97
5/10/01	2812.90
8/10/01	2765.37
9/10/01	2794.42
10/10/01	2896.60
11/10/01	2943.69
12/10/01	2953.39
15/10/01	2976.30
16/10/01	2992.46
17/10/01	3043.85
19/10/01	3016.84
22/10/01	3001.80
23/10/01	3061.91
24/10/01	3047.92
25/10/01	3022.16
29/10/01	3009.33
30/10/01	2957.45
31/10/01	2989.35

You are **required** to test the weak form of efficient market hypothesis by applying the “Run test” at 5% and 10% level of significance.

(9 points)

5. The closing value of the Sensex is given below:

Day	Closing Sensex value
1	2795.30
2	2754.95
3	2788.97
4	2812.90
5	2765.37

You are **required** to

- Calculate the Relative Strength Index (RSI) of the Sensex at the end of Day 5 and
- Interpret the result obtained in (a) above.

(4 + 2 = 6 points)

6. Consider the stock of Bharti Chemicals has the following regression line

$$r_{it}(\%) = a_i + \beta_{i \text{ mkt}} + e_{it}$$

Where the notations are in their standard use. The regression line explains only 80% of the variation in the return on Bharti's stock. The variance in market return is 95(%²). The covariance of stock return with that of market is 110 (%²).

You are **required** to find

- Systematic and unsystematic risk for Bharti stock.
- Whether the stock of Bharti is defensive or aggressive?

(4 + 1 = 5 points)

END OF PART B

Part C : Applied Theory (20 Points)

- This part consists of questions with serial number 7 - 8.
- Answer **all** questions.
- Points are indicated against each question.
- Do not spend more than 25 -30 minutes on Part C.

7. Futures is the new buzz word in trading circle of Indian bourses. In this connection discuss the following
- Inter market cross margining
 - Hedging

(5 + 5 = 10 points)

8. Technical Analyst always consider market timing more important factor. Elliott wave theory was originally used by them to major stock market averages, particularly the Dow Jones Industrial average. Discuss the basic tenets of Elliott wave theory and the wave personalities advocated by it.

(10 points)

END OF PART C

END OF QUESTION PAPER

Suggested Answers

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Part A : Basic Concepts

1. Answer : (c)
Reason : Duration of equity = $\frac{1}{\text{Dividend yield}} = \frac{1}{2/58.15} = 29.075 \approx 29$ years.
2. Answer : (d)
Reason : To limit default one should buy AAA bond. Further to limit interest rate risk one should choose bond for shorter maturity. Therefore, option **d** is recommended for having less maturity than other AAA bond under options **b**.
3. Answer : (c)
Reason : Due to increase in inflation r_m and r_f rise by the same value hence, market price of risk i.e., slope of SML will not change. Beta does not change due to the change in inflation as $\beta = \frac{\text{Cov}(i, m)}{\text{Var}(m)}$ and the Cov (i,m) as well as Var_m does not change with the inflation. However, the required return for average stock increase due to higher riskfree return.
4. Answer : (d)
Reason : If the credit rating of an ordinary plain vanilla bond is downgraded, then the market price falls and as a result ytm rises. It may be noted that the change in credit rating in no way affect the indenture contract on bonds coupon rate.
5. Answer : (e)
Reason : The coupon paying bonds and preferred stocks which pay interest at fixed rate are facing higher interest rate risk. Zero coupon bonds of average maturity and short term treasury bonds face relatively less risk. Though both of these are issued at discount and redeemed at face value or premium, treasury bills having shorter maturity will face less interest rate risk.
6. Answer : (e)
Reason : YTM is the rate of return at which the PV of all the cash flows would be equal to zero. Therefore, the statement I is correct.

Closer to maturity the duration of the bond becomes small and hence the sensitivity of the bond price to the change in the interest rate reduces

The bonds with a call feature can be called by the issuer at an early date i.e., the debt may be paid off early.
7. Answer : (d)
Reason : In an in-the-money call option the exercise price is less than the current market price i.e., the option is having a positive intrinsic value and the buyer would make profit if the option is exercised today (in the case of an American option) on the present value of profit (in case of a European option)
8. Answer : (d)
Reason : The buyer of the put option on stock gets the right to sell the share at the exercise price hence the writer has an obligation to buy share at the exercise price.
9. Answer : (d)
Reason : As per DDM
$$P_0 = \frac{D_0(1+g)}{k-g}$$

The underlying assumptions are:
i. It assumes that each future dividend is $(1+g)$ times greater than prior dividend
ii. The discount rate, $k >$ growth rate, g
iii. The growth rate, g remains constant.

10. Answer : (d)
Reason : As per the efficient market hypothesis the efficiency of the stock market is tested. Under the hypothesis it is assumed that information regarding expected return is discounted in the market and the shares sell at their fair market value and equilibrium rate of return prevail. Then it talks about the forms of efficiency and possibility of earning abnormal return by the investor. In no circumstances it says that positive return cannot be earned.
11. Answer : (e)
Reason : ABB is group A share and not a sensex scrip. All others i.e. MTNL, BHEL, ITC and Nestle India are included in Sensex at present.
12. Answer : (d)
Reason : The stock exchanges have organized themselves in the form of
- A public limited company, on (eg. The Calcutta stock exchange)
 - A company limited in guarantee (eg. Madras stock exchange)
 - Voluntary non profit making association of person (eg. The stock exchange, Mumbai)
13. Answer : (c)
Reason : The fall in ROE in 2001 over 2000 is due to fall in profit margin as well as fall in tax efficiency. Compared to 1.85% fall in profit margin, tax efficiency has fallen by 16.09%.
14. Answer : (c)
Reason : Revised value of base year market capitalization is
- $$= 269.16 + \frac{1240}{(287190.47 / 269.16)} = \text{Rs.} 270.32 \text{ Crore.}$$
15. Answer : (c)
Reason : Undervalued stock is one on which the current market price is less than intrinsic value of the stock. Normally the intrinsic value is arrived at by capitalization of all future earnings and not by book value. Therefore, statement a) is not correct.
- Further $\frac{\text{Price per share (P)}}{\text{Book Value per share (B)}} = \frac{\text{RoE} \times b}{K - g}$ where b is dividend payout ratio.
- We find that $\frac{P}{B}$ is linearly related and is only dependent on payout ratio, K & g.
- Statement d) is not correct as higher growth rate will reduce the value of the denominator thereby pushing up the P/B value.
16. Answer : (d)
Reason : $P/E = \frac{b}{k - g}$ if growth rate is higher then intrinsic value of P/E should be higher. Therefore, a lower P/E indicates under valued firm.
17. Answer : (e)
Reason : Statements a), b), c) and d) are correct. Statement e) is not correct as when the moving average line is flat and the price line falls below it then a reversal in the **bullish** trend is signaled.
18. Answer : (c)
Reason : Statement a) is false as the significance of a pattern is a direct function of its size and depth statement b) is also false as the longer it takes for prices to move out of the pattern, the stronger is the base of the new trend.
- Statement d) is not correct as a valid breakout can be confirmed in most cases, if the penetration of the boundaries of a pattern are marked by price change equal to more than 3%
- Similarly, statement e) is not correct as validity of a breakout should be confirmed by volume statistics. Momentum indicator gives advance signal.

19. Answer : (d)

Reason : $15 = R_f + 2 (10 - R_f)$

i.e., $R_f = 20 - 15 = 5\%$

Revised $R = 5 + 2 (15 - 5) = 25\%$

20. Answer : (d)

Reason : $P = \frac{D_o(1+g)}{k-g} = \frac{4.5 \times (1.05)}{0.09-0.05} = \text{Rs.}118.125 \text{ i.e. Rs.}118.$

21. Answer : (d)

Reason : YTM using approximate formula $= \frac{100 + \frac{(1000-950)}{2}}{\frac{1000+950}{2}}$
 $= 0.1282 \text{ i.e., } 12.82\%$
 $= 13\%$

Cross check

$P_0 = 100 \times \text{PVIF}(13\%, 1) + 1100 \times \text{PVIF}(13\%, 2) = 949.96 \text{ i.e. Rs.}950.$

22. Answer : (b)

Reason : Assuming pure expectations theory hold good, two years interest rate, $r_{0,2}$ will be calculated from following expressions.

$(1 + r_{0,2})^2 = (1 + r_{0,1}) (1 + f_{1,2}) = (1 + 0.0925) (1 + 0.095) = 1.19629$

$\Rightarrow r_{0,2} = \sqrt{1.19629} - 1 = 0.09375 \text{ i.e., } 9.375\%.$

Hence liquidity premium

$= 9.75 - 9.375 = 0.375\% \text{ i.e. } 0.38\%.$

23. Answer : (b)

Reason : Price of the bond at prevailing interest rate of 9%

$= 70 \times \text{PVIFA}(9\%, 5) + 1000 \times \text{PVIF}(9\%, 5)$

$= 70 \times 3.8897 + 1000 \times 0.6499 = 922.21$

Price of the 7% coupon bond at prevailing interest rate of 7% = Rs.1000.00

$\Rightarrow \text{Capital Gains} = 1000 - 922.21 = \text{Rs.}77.79$

24. Answer : (c)

Reason : $\sigma_p^2 = 0.4^2 10^2 + 0.6^2 \times 15^2 + 2 \times 0.4 \times 0.6 \times 0.5 \times 10 \times 15 = 133 (\%)^2$

25. Answer : (c)

Reason : The company using LIFO compared to the ones using FIFO will have higher cost of good sold and will result in lower net income, lower current assets as well as lower cash flow from operations.

26. Answer : (b)

Reason : Stock splits, stock dividends, bonus issues, as well as reverse stock split do not change the level of shareholder's equity (i.e., paid up capital and reserves). Only cash dividends of earnings is paid out and reserves of the shareholder's equity. It leads to reduction in owner's equity at any given point of time.

27. Answer : (d)

Reason : SML plots returns of the stocks on y axis and the systematic risk β on x axis.

28. Answer : (b)

$$\text{Reason : Premium over conversion value} = \frac{1300 - 20 \times 55}{20 \times 55} \times 100 = 18.18\%$$

29. Answer : (e)

Reason : Statement II is not correct as payoff may be linear at times

30. Answer : (d)

Reason : All under a), b) and c) are macro factors.

Part B: Problems

1. The net operating income (NOI) for a month, for these properties is as under:

Property	Rental Value (Rs.)	Electricity Charges (Rs.)	Water Charges (Rs.)	Net operating Income (Rs.)	
				Per month	Per annum
A	5,000	460	200	5,660	67,920
B	4,750	510	150	5,410	64,920
C	5,175	525	180	5,880	70,560

The calculation of capitalization rate is shown below:

Property	NOI per annum	Market Value (Rs.)	(3) = $\frac{(1)}{(2)} \times 100\%$
	(1)	(2)	
A	67,920	9,00,000	7.55
B	64,920	9,25,000	7.02
C	70,560	9,50,000	7.43

$$\text{Therefore, average capitalization rate} = \frac{7.55 + 7.02 + 7.43}{3} = 7.33\%$$

2. The intrinsic value of the above PCD is calculated as under:

a. Present value of interest payments

$$\begin{aligned} &= 12 \times \text{PVIFA}(7\%, 3) + 6 \times \text{PVIFA}(7\%, 11) \times \text{PVIF}(7\%, 3) \\ &= 12 \times 2.6243 + 6 \times 7.4987 \times 0.8163 = 68.2186 \\ &\cong 68.22. \end{aligned}$$

b.

Year Ended	2000	2001	2002	2003
Bonus adjusted EPS (Rs.)	3.50	4.00	4.33	4.53

Growth rate (g) implicit in the bonus adjusted EPS can be obtained from the equation

$$3.5(1 + g)^3 = 4.53$$

$$\begin{aligned} \Rightarrow g &= \left(\frac{4.53}{3.5} \right)^{\frac{1}{3}} - 1 \\ &= 0.0898 \text{ i.e. } 8.98\% \end{aligned}$$

$$\text{Projected EPS in July, 2003} = 3.4 \left(1 + \frac{0.0898}{3} \right) = \text{Rs.3.50}$$

Average P/E ratio between January 2003 to July 2003 (6 months period prior to conversion)

$$= \frac{15.0+14.8+14.5}{3} = 14.77.$$

Therefore, projected market price of share after 18 months = $3.50 \times 14.77 = \text{Rs.51.70}$

Present value of market value of conversion after eighteen months

$$= 51.70 \times 2 \times \text{PVIF} (7\%, 3)$$

$$= 103.40 \times 0.8163 = \text{Rs.84.41}$$

c. Present value of non-convertible portion redeemed after 7 years

$$= 100 \times \text{PVIF} (7\%, 14)$$

$$= 38.78.$$

d. Intrinsic value of the PCD = A + B + C

$$= 62.88 + 84.41 + 38.78$$

$$= \text{Rs.191.41}$$

Therefore, it is recommended not to invest in the proposed PCD as it is just rightly priced whereas the projected declining P/E ratio may take the price of convertible portion further down.

3. a. i. We can find forward rates $f_{1,1}$ and $f_{2,1}$ using the spot rates y_1 , y_2 and y_3 :

$$(1 + y_2)^2 = (1 + y_1)(1 + f_{1,1}) \text{ and}$$

$$(1 + y_3)^3 = (1 + y_2)^2 (1 + f_{2,1})$$

For $f_{1,1}$

$$(1.092)^2 = (1.091)(1 + f_{1,1})$$

$$f_{1,1} = 0.093 \text{ i.e. } 9.3\%$$

For $f_{2,1}$

$$(1.093)^3 = (1.092)^2 (1 + f_{2,1})$$

$$\Rightarrow f_{2,1} = 0.05 \text{ i.e. } 5\%$$

ii. The value of the bond at $t = 0$

$$= 10 (\text{PVIF}_{9.1\%,1} + \text{PVIF}_{9.2\%,2} + \text{PVIF}_{9.3\%,3}) + 110 \times \text{PVIF}_{9.3\%,3}$$

$$= 10 (0.9166 + 0.8386 + 0.7658) + 110 \times 0.7658 = \text{Rs.109.45}$$

b. i. $100 = 10 \text{ PVIFA}(r, 3) + 110 \text{ PVIF}(r, 3)$

$$\text{Consider } r = 11\% \quad \text{R.H.S.} = 10 \times 2.4437 + 110 \times 0.7312 = 104.869$$

$$\text{Consider } r = 12\% \quad \text{R.H.S.} = 10 \times 2.4018 + 110 \times 0.7118 = 102.316$$

$$\text{Consider } r = 13\% \quad \text{R.H.S.} = 10 \times 2.3612 + 110 \times 0.6931 = 99.853$$

$$\text{By interpolation, YTM, } r = 12 + \frac{102.316 - 100}{102.316 - 99.853} \times 1$$

$$= 12.94\%$$

$$\cong 13\%.$$

$$\begin{aligned} \Rightarrow \text{Duration} &= \frac{r_c}{r_d} \times \text{PVIFA}(r_d, n) \times (1 + r_d) + \left(1 - \frac{r_c}{r_d} \right) \times n \\ &= \frac{0.10}{0.13} \times 2.3612 \times (1.13) + \left(1 - \frac{0.10}{0.13} \right) \times 3 = 2.74 \text{ yrs.} \end{aligned}$$

$$\begin{aligned} \text{ii. } D_{\text{mod}} &= \frac{D}{1 + \frac{r_d}{f}} \\ &= \frac{2.74}{1 + 0.13} = 2.42 \text{ years} \end{aligned}$$

$$\begin{aligned}\frac{\Delta P_o}{P_o} \times 100 &= -D_{\text{mod}} \times \frac{\Delta BP}{100} \\ &= -2.42 \times \frac{50}{100} \\ &= -1.21\%\end{aligned}$$

i.e., 1.212% fall in bond price.

Therefore new price = $100 \times (1 - 0.0121) = \text{Rs.}98.79$

4. To test the independence of the prices, we require

Total number of runs : r

No. of positive runs : n_1

No. of negative runs : n_2

The mean and the standard error of the mean are calculated by the following formulas:

$$\mu_r = \frac{2n_1n_2}{n_1 + n_2} + 1$$

$$\text{and } \sigma_r = \sqrt{\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)}}$$

Date	Closing Sensex	Sign of Price Changes
1/10/01	2795.30	
3/10/01	2754.95	(-)
4/10/01	2788.97	(+)
5/10/01	2812.90	(+)
8/10/01	2765.37	(-)
9/10/01	2794.42	(+)
10/10/01	2896.60	(+)
11/10/01	2943.69	(+)
12/10/01	2959.39	(+)
15/10/01	2976.30	(+)
16/10/01	2992.44	(+)
17/10/01	3043.85	(+)
19/10/01	3016.84	(+)
22/10/01	3001.80	(-)
23/10/01	3061.91	(+)
24/10/01	3047.92	(-)
25/10/01	3022.16	(-)
29/10/01	3009.33	(-)
30/10/01	2957.45	(-)
31/10/01	2989.35	(+)

Total number of price changes, r = 8

No. of positive price changes, n_1 = 11

No. of negative price changes, n_2 = 8

$$\mu_r = \frac{2 \times 11 \times 8}{11 + 8} + 1$$

$$= \frac{176}{19} + 1 = 10.26$$

$$\begin{aligned}
\hat{\sigma}_r &= \left(\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)} \right)^{1/2} \\
&= \left(\frac{(2 \times 11 \times 8)(2 \times 11 \times 8 - 11 - 8)}{(11+8)^2(11+8-1)} \right)^{1/2} \\
&= \left(\frac{176 \times 157}{(19)^2(18)} \right)^{1/2} \\
&= (4.252)^{1/2} = 2.06
\end{aligned}$$

Since too few runs in this case would indicate that the movement of prices is not random, we employ a two-tailed test to test the randomness of prices.

Test at 5% significance level

At $\alpha = 0.05$, using t – table at 18 degrees of freedom

$$\text{The lower limit: } \mu_r - t \times \hat{\sigma}_r = 10.26 - 2.101 \times 2.06 = 5.932$$

$$\text{The upper limit: } \mu_r + t \times \hat{\sigma}_r = 10.26 + 2.101 \times 2.06 = 14.588$$

At 10% confidence interval we have:

$$\text{Lower limit} = 10.26 - 1.734 \times 2.06 = 6.688 \text{ and upper limit} = 10.26 + 1.734 \times 2.06 = 13.832$$

As observed r lies between these limits, hence, both confirms that Indian stock market exhibits the weak form of market efficiency.

5. a.

Day	Closing Sensex Value	Trend
1	2795.30	
2	2754.95	Down (-)
3	2788.97	Up (+)
4	2812.90	Up (+)
5	2765.37	Down (-)

$$RSI = 100 - \frac{100}{1 + RS}$$

$$\begin{aligned}
RS &= \frac{\text{Average of up closing prices}}{\text{Average of down closing prices}} \\
&= \frac{(2788.97 + 2812.90) / 2}{(2754.95 + 2765.37) / 2} \\
&= \frac{2800.93}{2760.16} = 1.0148.
\end{aligned}$$

$$\begin{aligned}
RSI &= 100 - \frac{100}{1 + RS} \\
&= 100 - \frac{100}{2.0148} = 100 - 49.63 = 50.37
\end{aligned}$$

b. A value near 50 indicates the prevailing price is neither in overbought or oversold position.

6. a. $\text{Cov}_{(i, m)} = \rho_{i, m} \sigma_i \sigma_m$
- $$\Rightarrow 110 = \sqrt{\text{Coefficient of determination}} \times \sigma_i \times \sqrt{95} = \sqrt{0.80} \times \sigma_i \times \sqrt{95}$$
- $$\Rightarrow \sigma_i = \frac{110}{\sqrt{0.8 \times 95}} = 12.62\%$$
- Systematic risk of Bharti stock = $\rho_{i, m}^2 \sigma_i^2 = 0.8 \times (12.62)^2 = 127.41(\%)^2$
- Unsystematic risk of Bharti Stock = $(1 - \rho_{i, m}^2) \sigma_i^2 = 0.2 \times (12.62)^2 = 31.85(\%)^2$
- b. Beta of Bharti stock, $\beta_{i, m} = \rho_{i, m} \frac{\sigma_i}{\sigma_m} = \sqrt{0.8} \times \frac{12.62}{\sqrt{95}} = 1.158$ i.e. 1.16
- As beta of Bharti stock is more than 1 it is an aggressive stock.

Part C: Applied Theory

7. a. **Intermarket Cross Margining**

In this method of margining, a trader's initial margin requirement would be decided by considering his entire portfolio, even if the different constituents of the portfolio happen to be with different exchanges. For example, the T-bill futures are traded at Chicago Mercantile Exchange and Treasury bond futures at Chicago Board of Trade. If a trader who holds a spread between T-bills and T-bonds deposits the initial margin depending on the spread, it would be an example of Intermarket Cross Margining. Intermarket Cross Margining depends on a trader's total holding in different markets.

The reasoning behind this method is that the trader's portfolio risk is usually less than the risk of the individual constituents. The other advantages of this method are

- the total amount of initial margin deposit would be lower for a given degree of risk protection, necessarily freeing capital for other purposes;
- that a central clearing house, while servicing various markets, reduces the transfers of funds between different accounts increasing the overall efficiency of the system;
- it increases liquidity, as lower margins attract large number of traders.

b. **Hedging**

We have seen in the introduction part, that in futures market all categories of people try to hedge their risk. As an example, we looked at a farmer and a baker, who in order to protect their price and the profits, went to a futures exchange to buy futures contracts. The futures markets, thereby, perform an important social function. While hedging, if the trader is thinking of acquiring any asset, he would buy a futures contract and therefore, become immune to any price rise in future and if he is thinking of disposing an asset, he will sell a futures contract, also with the sole aim of gaining immunity against falling prices. In the first case, it is referred to as a long hedge and in the later part it is a short hedge.

8. **Basic Tenets**

The most important element of wave theory is wave patterns of formations. The other important aspect is ratio analysis which is useful in determining retracement points and price objectives by measuring the relationships between the different waves. Finally, time relationships also exist and can be used to confirm the wave patterns and ratios, but are considered by some Elliotticians to be less reliable in market forecasting.

Elliott Wave Theory, was originally applied to the major stock market averages, particularly the Dow Jones Industrial Average. In its most basic form, the theory says that the stock market follows a repetitive rhythm of a five-wave advance followed by a three-wave decline. Shows one complete cycle. If you count the waves, you will find that one complete cycle has eight waves – five up and three down. In the advancing portion of the cycle, notice that each of the five waves are numbered. Waves 1, 3 and 5 – called impulse waves are rising waves, while waves 2 and 4 move against the uptrend. Waves 2 and 4 are called corrective waves because they correct waves 1 and 3. After the five-wave numbered advance has been completed, three-wave correction begins. The three corrective waves are identified by the letters A, B and C.

Along with the constant form of the various waves, there is the important consideration of degree. There are many different degrees of trend. Elliott, in fact, categorized nine different degrees of trend (or magnitude) ranging from a Grand Supercycle spanning two hundred years to a subminute degree covering only a few hours. The point to remember is that the basic eight-wave cycle remains constant no matter what degree of trend is being studied.

Each wave subdivides into waves of one lesser degree which in turn, can also be subdivided into waves of even lesser degree. It also follows then that each wave is itself part of the wave of the next higher degree.

Wave Personalities

Another area where the two theories overlap to some extent is in the description of the three phases of a bull market. A knowledge of these wave personalities can be helpful, especially when wave counts are unclear. It's also important to remember that these wave personalities remain constant in all the different degrees of trend.

Wave 1

About half of the first waves are part of the basing process and often appear to be nothing more than a rebound from very depressed levels. First waves are usually the shortest of the five waves. These first waves can sometimes be dynamic, especially if they occur from major base formations.

Wave 2

Second waves usually retrace or give back, all or most of wave 1. The ability of wave 2, however, to hold above the bottom of wave 1 is what produces many of the traditional chart patterns, such as double or triple bottoms and inverse head and shoulders bottoms.

Wave 3

The third wave is usually the longest and the most dynamic, at least in the common stock area. The penetration of the top of wave 1 registers all kinds of traditional breakouts and Dow Theory buy signals. Virtually, all technical trend following systems have jumped on the bull bandwagon by this point. Volume is usually the heaviest during this wave and gaps prevail. Not surprisingly, the third wave is also the most likely to extend. Wave 3 can never be the shortest in a five-wave advance. By this time, even the fundamentals are looking good.

Wave 4

The fourth wave is usually a complex pattern. Like wave 2, it is corrective or a consolidation phase, but usually differs from wave 2 in its construction. Triangles usually occur in the fourth wave. One cardinal rule of Elliot analysis is that the bottom of wave 4 can never overlap the top of wave 1.

Wave 5

In stocks, wave 5 is usually much less dynamic than wave 3. In commodities, wave 5 is often the longest wave and one most likely to extend. It is during wave 5 that many of the confirming technical indicators, such as On Balance Volume (OBV), begin to lag behind the price action. It is also at this point that negative divergences begin to develop on various oscillators, warning of a possible market top.

Wave A

Wave A of the corrective phase is usually misinterpreted as just a normal pull-back in the uptrend. Having already spotted several oscillator divergences on the prior advance, the alert technician may also notice a shift in the volume pattern at this point. Heavier volume may now have shifted to the downside, although that is not necessarily a requirement.

Wave B

Wave B, the bounce in the new downtrend, usually occurs on light volume and usually represents the last chance to exit old long positions gracefully and a second chance to initiate new short sales. Depending on the type of correction taking place, the rally may test the old highs (forming a double top) or even exceed the old highs before turning back down.

Wave C

Wave C leaves little doubt that the uptrend has ended. Again, depending on the type of correction in progress, wave C will often decline well below the bottom of wave A, registering all kinds of traditional technical sell signals. In fact, by drawing a trendline under the bottoms of wave 4 and wave A, the familiar head and shoulders top sometimes appears.