

Question Paper

Security Analysis – I (211) : July 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. Which of the following statements is/are **true**?
 - I. A unique characteristic line is plotted for each security
 - II. For a characteristic line, the x-axis represents betas for different securities
 - III. The slope of the characteristic line is the difference between the market returns and risk-free returns.
 - a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (II) and (III) above.
2. The average assets turnover ratio of a company is 1.60 and its net profit margin is 14%. The return on average assets of the company is
 - a. 8.75%
 - b. 11.43%
 - c. 12.50%
 - d. 14.00%
 - e. 22.40%
3. If the current one year interest rate is 25% and the three year interest rate is 22%, then the two year interest rate next year is expected to be
 - a. 19.1
 - b. 20.5
 - c. 22.6
 - d. 26.5
 - e. 28.1
4. Which of the following statements is/are **true**?
 - I. The formation of head and shoulders pattern indicates buy signal
 - II. Formation of flags indicate reversal in trend
 - III. A rectangle is a consolidation pattern or result in reversal.
 - a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. Both (II) and (III) above.
5. An option writer writes a 6-m naked call option on a stock at a premium of Rs.3 and the strike price of Rs.150. The prevailing market price of the stock is Rs.130. If on the expiration day the price of the stock is Rs.140, then the profit/loss to the option writer will be
 - a. Rs. -10
 - b. Rs. 7
 - c. Rs. 3
 - d. Rs. 10
 - e. Rs. 13

6. For a stock 's', the unsystematic risk in terms of percentage of total risk is 66 and the variance of its returns is $256(\%)^2$. The coefficient of correlation of its returns with the market will be
- 0.16
 - 0.22
 - 0.47
 - 0.58
 - 0.76
7. The intensity of rivalry among the existing players in an industry will be high when
- Industry growth rate is slow
 - Product differentiation is high
 - Exit barriers are low
 - Economies of scale are low
 - Both (a) and (b) above.
8. Consider the following data of XYZ Ltd.
- | | | |
|--------------------------|---|-------|
| Face value of the share | = | Rs.10 |
| Earnings per share | = | Rs.25 |
| Dividend pay-out ratio | = | 60% |
| P/E multiple of the firm | = | 6 |
- The duration of the equity of the firm is
- 1.6 years
 - 4 years
 - 10 years
 - 25 years
 - Cannot be determined.
9. Which of the following statements is/are **true** with respect to a moving average?
- When the price line rises above the moving average, a reversal in bullish trend is signaled
 - The crossover of longer time span is more significant than a crossover of shorter time span
 - A moving average cannot act as support/resistance level
 - These are lead indicators and provide signals to buy or sell
 - Both (a) and (b) above.
10. Which of the following aspects of investing in real assets differ from investing in securities?
- The type of income derived
 - The manner in which the assets are derived
 - The way inflation affects real assets
- Only (I) above
 - Only (II) above
 - Only (III) above
 - Both (I) and (II) above
 - All (I), (II) and (III) above.
11. Which of the following is/are features of an efficient market?
- Breadth of the market should be large
 - Existence of information arbitrage efficiency
 - Existence of allocational efficiency.
- Only (II) above
 - Only (III) above
 - Both (I) and (III) above
 - Both (II) and (III) above
 - All (I), (II) and (III) above.

12. Which of the following is/are diversifiable risks for an investor?
- I. Sector risk
 - II. Technological risk
 - III. Market risk
 - IV. Management risk.
- a. Only (II) above
 - b. Only (III) above
 - c. Both (I) and (IV) above
 - d. Both (I) and (II) above
 - e. (I), (II) and (IV) above.
13. Which of the following is a lag indicator?
- a. Utilization of manufacturing capacity
 - b. Change in general level of stock prices
 - c. Residential construction
 - d. Corporate profits
 - e. None of the above.
14. Which of the following is **true** with respect to bond price theorems?
- a. If the YTM is greater than the coupon rate, the market price of the bond will be equal to the par value of the bond
 - b. A change in YTM affects the prices of the bonds with lower YTM more than it does bonds with a higher YTM
 - c. If the YTM equals its coupon rate, the market price of the bond will be equal to the par value of the bond
 - d. For a given difference between YTM and coupon rate of the bonds, the shorter the term to maturity, the higher will be the change in the price with change in YTM
 - e. Other things remaining the same, for any given change in YTM, the percentage price change in case of bonds of low coupon rate will be smaller than in case of bonds of high coupon rate.
15. If the security prices exhibit weak form of efficiency, one will **not** gain if he
- I. Analyses the past prices in the form of charts to identify the pattern.
 - II. Buys stock of a company based on publicly available information
 - III. Collects inside information about the proposed merger of the company with another company.
- a. Only (I) above
 - b. Only (II) above
 - c. Only (III) above
 - d. Both (I) and (II) above
 - e. All (I), (II) and (III) above.
16. Consider the following data regarding stock of Butec Ltd. and the market:
- | | |
|--|-------------|
| Beta of Butec Ltd. | 0.8 |
| Variance of returns on market | $100(\%)^2$ |
| Correlation coefficient of the market returns with returns on Butec Ltd. | 0.5 |
- The variance of returns on Butec Ltd. is
- a. $64(\%)^2$
 - b. $80(\%)^2$
 - c. $156(\%)^2$
 - d. $256(\%)^2$
 - e. $400(\%)^2$.

17. Consider the data given below:

Day	Closing price (Rs.)
1	130.00
2	138.00
3	145.00
4	140.00
5	135.00
6	138.00

If the time span of the average is 5 days, its simple moving average price on the 6th day is

- Rs.134.0
 - Rs.137.5
 - Rs.137.6
 - Rs.139.2
 - Rs.140.0
18. An entrepreneur is planning an investment in electronic goods industry. The relevant data is as under:

Estimated industry sales	Rs.6000 crore
Estimated market share of the company	5%
Estimated net profit margin of the industry	30%
Estimated operating profit margin of the company	40%
Estimated net profit margin of the company	20%
Number of outstanding shares of the company	10 crore

Assuming that there are no outstanding preference shares, the forecast value of the EPS for the company will be

- Rs. 2.4
 - Rs. 6.0
 - Rs.10.8
 - Rs.12.0
 - Rs.14.4
19. Which of the following is a property of duration?
- The duration of a perpetual bond is equal to $r/(1+r)$, where 'r' is the YTM of the bond
 - For a zero coupon bond duration is less than its terms to maturity
 - Increase in YTM reduces the duration of the bond
 - When the market price of the bond is equal to the face value, the duration decreases with increase in term to maturity
 - An increase in the frequency of coupon payments increases the duration.
20. The initial margin on a futures contract is Rs.10,000 and the maintenance margin is Rs.7,500. If the balance in the margin account is Rs.8,000, the variation margin required is
- Rs.10,000
 - Rs. 8,000
 - Rs. 7,500
 - Rs. 500
 - Nil.
21. Which of the following is **not** a constraint for achievement of investment objectives?
- Liquidity
 - Age
 - Need for regular income
 - Tax liability
 - Volatility of returns.

22. The correlation coefficient of return on stock X with market return is negative. Which of the following is the implication of the given statement?
- On an average the returns from stock and market move in opposite directions
 - The average risk of stock X is less than the market risk
 - The average return of stock X is more than the market return
 - Stock X has given an above normal return
 - Stock X has given a below normal return.
23. Other things remaining the same, during the later years of the life of the asset, switchover from straight line method to WDV method of depreciation will result in
- Lower net fixed assets
 - Higher tax liability
 - Higher fixed assets turnover ratio
 - Higher current assets
 - Higher cost of sales.
24. What will be the capital gains on a 3 year 12% annual coupon bond of face value Rs.1,000 if interest rates go down from 12% to 10%? Assume that the bond is redeemable in one year from now at face value.
- Rs. 10.20
 - Rs. 18.18
 - Rs. 49.44
 - Rs. 98.88
 - Rs.101.20
25. Which of the following is a purpose for the construction of stock indices?
- The growth in the primary market volumes can be measured through the movement of index
 - Indices help in finding the quantum of FII investments
 - Indices help in deciding on the allocation of resources between productive and non-productive lines of activities
 - The changes in share prices across the market can be estimated through the movement of indices
 - An index helps in finding the gain/loss from investment in a particular share.
26. The required return on stock 's' is 16% and the expected return on the market is 8%. Suddenly due to economic conditions, the expected return on the market increases to 12% and the new required rate of return on the stock increases to 20%. If the stock is currently in equilibrium and other things remaining the same, what would be beta of the stock?
- 1.00
 - 0.80
 - 0.60
 - 0.50
 - 0.25
27. Which of the following is/are the difference(s) between options and warrants?
- Warrants can be created only when the company wants to issue them but options can be created between any two people willing to trade in options (on an exchange)
 - An exercise of warrants leads to increase in the stocks outstanding while the exercise of an option does not have any such effect
 - Options are traded but warrants are not
 - Both (a) and (b) above
 - All (a), (b) and (c) of the above.

28. Earnings per share of SNN Ltd. expected at the end of the year 2002-2003 is Rs.18.00. The earnings per share in the year 2001-2002 is Rs.16.00. The required rate of return is 25% p.a. and the dividend payout ratio is 30% which is expected to remain constant. If the earnings are expected to grow at the historical growth rate, the value of the share of the company at the beginning of 2002-2003 is
- Rs.72.00
 - Rs.43.20
 - Rs.38.40
 - Rs.21.60
 - Cannot be determined as the growth rate is higher than the required rate of return.
29. A 5 year bond bearing a coupon of 11.5% was issued by White Cements Ltd. in April, 2002 with put and call options. Due to changes in interest rates subsequent to the issue, the holder of the bond faces some risks. Which of the following is/are **not** the risk(s) faced by the bond holder?
- Reinvestment risk
 - Price risk
 - Call risk
 - Default risk
 - None of the above.

30. Consider the following data of JM Mutual Fund (Income plan):

	Rs. in crore
Value of investments	2084.52
Receivables	162.88
Accrued income	47.74
Other current assets	573.23
Liabilities	488.56
Accrued expenses	112.92

If the number of outstanding units is 160 crore and sales charge is 2.5% on the NAV, the public offering price is

- Rs.14.17
- Rs.14.53
- Rs.15.58
- Rs.15.98
- Rs.21.69.

END OF PART A

Part B : Problems (50 Points)

- This part consists of questions with serial number 1 – 6.
- 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. The closing values of the sensdex during the month of May 2002 are as follows:

Date	Closing Value of the Sensdex
2 May	3,372.56
3 May	3,380.61
6 May	3,384.35
7 May	3,423.75
8 May	3,435.06
9 May	3,462.01
10 May	3,431.32
13 May	3,442.49
14 May	3,420.33
15 May	3,395.59
16 May	3,355.61
17 May	3,333.76
20 May	3,282.81
21 May	3,186.53
22 May	3,175.49
23 May	3,114.05
24 May	3,255.62
27 May	3,243.41
28 May	3,146.83
29 May	3,160.24
30 May	3,149.25

Using runs test, verify the validity of the weak form of market efficiency in the Indian stock market at the significance level of 5% and 10%.

(8 points)

2. Mr. Anurag estimates that there will be annual cash outflows of Rs.40,000 for four years from the end of three years from now. Mr. Anurag wants to immunize the payments by investing in the following two bonds:

Bond A	:	A zero coupon bond of face value Rs.1,000 maturing after 6 years and currently traded at Rs.455.60
Bond B	:	12% coupon bearing bond of face value of Rs.1,000, maturing after 5 years, redeemable at par value and currently traded at Rs.930.90.

Assume the interest rate remains at 14%.

You are **required** to determine

- The proportion of funds to be invested in Bonds A and B such that Mr. Anurag's payments are immunized.
- Whether Mr. Anurag will still be immunized after 2 years from now.

(7 + 4 = 11 points)

3. Consider the following daily stock prices of a company listed on the Bombay Stock Exchange:

(Rs.)

Trading Day	High	Low	Close
1	330	290	300
2	320	270	290
3	310	280	300
4	315	290	300
5	325	300	315
6	340	290	310
7	345	300	330
8	325	285	300
9	305	250	300
10	290	240	280
11	285	240	260
12	295	250	280

You are **required** to

- Calculate % k stochastics for 6 day periods.
- Calculate % D stochastics for 4-day simple moving average of %k stochastics.

(4 + 1 = 5 points)

4. Sensex futures are traded at a multiple of 50. Consider the following quotations of sensex futures:

Date	Open	High	Low	Closing
03/05/2002	3363	3462	3315	3330
06/05/2002	3330	3378	3302	3350
07/05/2002	3350	3382	3342	3359
08/05/2002	3359	3362	3285	3302
09/05/2002	3302	3286	3190	3262
10/05/2002	3262	3277	3118	3122
13/05/2002	3122	3174	3074	3112
14/05/2002	3112	3156	3020	3069
15/05/2002	3069	3264	3056	3247

Mr.Raju purchased one futures contract on May 03. If the initial margin is Rs.25,000 and the maintenance margin is Rs.18,000, you are **required** to determine the daily balances in the margin account and payments on margin calls, if any.

(5 points)

5. White Clouds Ltd. has made a public issue of debentures of face value of Rs.100 with annual coupon of 12%. Each debenture has two parts – A and B. Part A, 50% of the face value will be converted into one equity share after one year from the date of allotment and Part B, the remaining 50% of the face value, will have a warrant attached to it.

The following are the options available to the investor:

- Exchange Part B and warrant for one equity share at the end of the 3rd year
 - Retain Part B and let the warrant lapse. In that case, Part B will be redeemed at the end of the 5th year.
- The current EPS of the equity share of face value of Rs.10 is Rs.8 and dividend payout ratio is 30%. The company's earnings are growing at a rate of 20% p.a. for the past 5 years but the growth rate is expected to decline to 17% p.a. for the next 5 years and stabilize at 8% p.a. thereafter. Dividend payout ratio remains constant. The required rate of return of the equity shareholders is 14%.

Assume that at the end of 5th year the equity shares are traded at their intrinsic value.

You are **required** to determine whether it is desirable to invest in the debentures of the company or not and if yes, which of the options of the bond should be chosen. Assume that the required rate of return is 20% and the investor wants to sell all the equity holdings at the end of the 5th year.

(11 points)

6. Consider the following information relating to the returns from two stocks and the market index in different economic scenarios:

Scenario	Probability of scenario	Stock A (%)	Stock B (%)	Return from market index (%)
Boom	0.25	-15	-8	-7
Slow growth	0.10	19	-5	12
Stagnation	0.45	35	25	20
Recession	0.20	15	18	25

From the above information, you are **required** to :

- Calculate the ex-ante beta for the two stocks
- Assuming that SML holds good, determine the Alpha of the two stocks and comment on the same. Also assume a risk free rate of interest of 7%.

(6 + 4 = 10 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. To forecast the economic conditions and their impact on stock prices, different approaches and forecasting techniques are used. Describe them.

(10 points)

8. Describe how the advance – decline (A-D) line is used measure the breadth of the market.

(10 points)

END OF PART C

END OF QUESTION PAPER

Suggested Answers

Security Analysis – I (211) : July 2002

Part A : Basic Concepts

1. Answer : (a)

Reason : Characteristic line is the regression line between the returns on a security and the market index. Returns on a security are plotted on the y-axis and the returns on the index on the x-axis. Characteristic line is the line of best fit between the actual observation of security returns and market returns. It represents the relationship between the return on a security and the index. Hence, each security has a unique characteristic line. Hence, I is true.

As already said above, the x-axis represents the returns on the market and not the betas of the securities. Hence, II is not true.

The slope of the security represents the beta of the particular security involved. Hence, III is also not true. Difference between market returns and risk-free return is the slope of Security Market Line.

2. Answer : (e)

Reason : Average assets turnover ratio = $\frac{NS}{\text{Average assets}} = 1.6$

Net profit margin = $\frac{NP}{NS} = 0.14$

Return on average assets = $\frac{NP}{\text{Average assets}} = \frac{NS}{\text{Average assets}} \times \frac{NP}{NS}$
 $= 1.6 \times 0.14 = 0.224 = 22.4\%$.

3. Answer : (b)

Reason : According to the expectations theory,

$$1 + r_{0,3} = [(1 + r_{01})(1 + f_{23})^2]^{1/3}$$

$$\text{or } (1 + f_{23}) = \left[\frac{(1 + r_{03})^3}{1 + r_{01}} \right]^{1/2} = \left[\frac{(1.22)^3}{1.25} \right]^{1/2} = 1.205$$

$$f_{23} = 1.205 - 1 = 20.5\%$$

4. Answer : (c)

Reason : A series of minor rallies and reactions which have almost identical peaks and troughs signal the formation of a rectangle. Formation of rectangle indicates equal pressure being exercised by buyers and sellers and the combat is indecisive until a breakout occurs which can be on either side. Hence, formation of rectangle can be considered as a consolidation of the trend or reversal in trend. Hence, III is true.

When two smaller rallies flank a higher rally just like a head between two shoulders, head and shoulders pattern is said to be formed. This pattern generally occurs at the end of the bull market and indicates the onset of the bear market and thus gives a sell signal. Hence, I is not true.

If a vertical rally or decline is interrupted by a consolidation pattern akin to a rectangle, such a formation is called as flag. Flags only represent a pause in a rally or reaction before prices move in the same direction as before. Hence, II is also not true.

5. Answer : (c)

Reason : An option writer who writes a call option has an obligation to sell whereas the buyer or the holder has the option to buy. A call option will be exercised by the buyer only when the price of the stock on the expiration day is more than the strike price of the call option. In the given case as the price of the stock on the expiration day is less than the strike price, the option holder will not exercise the option and pays the premium of the option to the writer. Hence, the gain to the writer will be premium which in this case is Rs.3.

6. Answer : (d)

Reason : Unsystematic risk (as a % of total risks) = $100(1 - \rho_{im}^2) = 66$

Where ρ_{im} is the co-efficient of correlation between returns on the security and market.

$$1 - \rho_{im}^2 = 0.66$$

$$\rho_{im}^2 = 1 - 0.66$$

$$\rho_{im} = \sqrt{0.34} = 0.58$$

7. Answer : (a)

Reason : If the industry growth is rapid every firm is sure to improve results just by keeping up with the industry. But, if the growth of the industry is slow every firm seeks to expand and this results in intense competition among the firms. Hence, intensity of rivalry will be high in situation (a).

In case there is product differentiation, buyers have preferences and loyalties to particular sellers and this insulates from competition among the firms. Hence, situation (b) cannot result in intense competition. If the exit barriers are low, the firms that lose the competitive battle will prefer to leave the industry rather than continue. Hence, there would not be any competition in situation (c). Economies of scale refer to decline in unit cost of a product as the absolute volume per period increases. If the economies of scale are high every firm seeks to increase the production and result in competition. On the other hand, low economies of scale discourage firms to expand and hence situation (d) does not result in intense competition.

8. Answer : (c)

Reason : Duration of the equity of the firm = $\frac{1}{\text{Dividend yield}} = \frac{1}{(25 \times 0.6) / 25 \times 6} = \frac{25 \times 6}{25 \times 0.6} = 10 \text{ years}$

9. Answer : (b)

Reason : As a moving average represents a smoothened trend, a moving average covering a longer time span is actually smoothening a long-term trend and its crossover is more significant than the crossover of a average covering a shorter time span. Hence, (b) is true.

When the price line rises above the moving average it indicates an uptrend and hence indicates the end of bear trend. Hence, (a) is not true.

As moving averages are smoothened trends, they can act as support or resistance level. Hence, (c) is not true.

Moving averages generally provide signals after the trend reversal has begun and hence have to be used with other indicators as they cannot be considered as lead indicators. Hence, (d) is not true.

10. Answer : (e)

Reason : Investors in real assets apart from earning financial gains also expect to receive certain psychic income. The unique nature, the liquidity risk and not being able to denominate in a particular currency – all these result in the valuation of real assets to be different from the valuation of monetary assets. The value of real assets tend to appreciate more rapidly than the rate of inflation whereas the value of monetary assets tend to reduce whenever the rate of inflation increases. Hence, all I, II and III are true.

11. Answer : (e)

Reason : Breadth of the market indicates the number of participants in the market. Breadth of the market is large implies that there are large number of participants in the market and a decision taken by any of these participants will not affect the market in a significant manner. Hence, statement I can be considered as one of the essential features of efficient market.

Information arbitrage efficiency is said to exist if the participants do not have any scope to reap abnormal profits using information which is of common knowledge. Hence, statement II is also considered as one of the essential features of efficient market.

Allocational efficiency is said to exist if the market channelizes resources into projects where the marginal efficiency of capital adjusted for risk differences is the highest. Hence, statement III is also one of the essential features of efficient market. Hence, (e) is the answer.

12. Answer : (e)

Reason : Sector risk, the risk of a sector not doing well, can be diversified by investing in different sectors. The changes in technology may affect the performance of an industry. However, the effects of technological changes differ from industry to industry and hence the technological risk can be diversified by investing in different industries which are affected differently by technological changes. Management risk, the risk of management being poor, can be diversified by investing in different securities, because the poor management of one company in a portfolio can be offset with the good management of another company in the portfolio. Hence, I, II and IV are considered as diversifiable risks.

Certain factors affect the entire market in a certain direction and such risk cannot be diversified completely. The risk that cannot be diversified or reduced is referred to as market risk. Hence, III is not diversifiable.

13. Answer : (e)

Reason : Utilization of manufacturing capacity indicates the prosperity of the economy. Higher utilization of manufacturing capacity implies higher production, better profits and good prosperity. Hence, the level of utilization of manufacturing capacity is considered as a good lead indicator. Similarly, an increase in general level of stock prices, increase in residential construction and increase in corporate profits indicates that the economy is prospering and vice-versa. Hence, all (a), (b), (c) and (d) are considered as good lead indicators and none of the above is the answer.

14. Answer : (c)

Reason : If the yield to maturity is equal to its coupon rate, the market price of the bond will be equal to the par value of the bond. Hence, (c) is correct.

If the YTM is greater than the coupon rate the market price of the bond will be lower than the par value of the bond. Hence, (a) is not correct.

A change in YTM affects the prices of the bonds. However, a change in YTM affects the bonds with higher YTM more than it does bonds with a lower YTM. Hence, (b) is also not correct.

A change in YTM affects the longer term bonds more than it does the shorter term bonds. Hence, (d) is also not correct.

A change in YTM affects the low coupon bonds more than it does the high coupon bonds. Hence, (e) is also not correct.

15. Answer : (a)

Reason : In a weak form of efficiency current prices reflect all historical information and any attempt to predict prices based on historical prices is futile. Hence, in a weak form of efficiency one will not gain if he analyses the past prices. Hence, (I) is the answer.

Statements II and III are not true because if current prices reflect all publicly available information it indicates semi-strong form of efficiency and if current prices reflect all publicly and privately available information it indicates strong form of efficiency and one can gain from the publicly and privately available information if the market is in its weak form of efficiency.

16. Answer : (d)

Reason : $\beta_s = \rho_{sm} \frac{\sigma_s}{\sigma_m}$

where β_s is the beta of the stock

ρ_{sm} is the correlation co-efficient of stock returns with the market returns

σ_s is the standard deviation of stock returns

σ_m is the standard deviation of market returns.

In the given case,

$$\begin{aligned} 0.8 &= 0.5 \times \frac{\sigma_s}{\sqrt{100}} \\ \Rightarrow \sigma_s &= \frac{0.8 \times 10}{0.5} = 16 \\ \sigma_s^2 &= 16^2 = 256(\%)^2 \end{aligned}$$

17. Answer : (d)

Reason : Simple moving average price on 6th day = $\frac{\text{Sum of prices from Day 2 to Day 6}}{5} = \frac{696}{5} = 139.2$

18. Answer : (b)

Reason : $\text{EPS} = \frac{\text{NP}}{\text{Number of shares}} = \frac{6000 \times 0.05 \times 0.2}{10} = \text{Rs.6}$

19. Answer : (c)

Reason : Duration is the average time at which the present value is received. Duration and YTM are inversely related. Hence, an increase in YTM results in a decrease in the duration of the bond. Hence, (c) is correct.

The duration of a perpetual bond is equal to $(1+r)/r$, where r is the current yield of the bond. Hence, (a) is not correct. For a zero coupon bond, which does not produce any income until redemption the duration is equal to its term to maturity. Hence, (b) is not correct. When the market price of the bond is equal to its face value, the duration increases with the increase in term to maturity. Hence, (d) is not correct. An increase in the frequency of payments increase the value of receipts and hence reduction in the duration of the bond. Hence, (e) is also not correct.

20. Answer : (e)

Reason : As the balance in the margin account is more than the maintenance margin, the amount required to be added to the margin account is nil.

21. Answer : (e)

Reason : An investor while meeting the investment objectives has to keep in mind certain constraints like liquidity, age, need for regular income, tax liability, etc. Liquidity is considered as one of the constraints because if the investor expects to have high liquidity he should avoid long term corporate debt, etc. The type of investment that can be chosen depends on the age of the investor because the risk tolerance ability and need for income are dependant on the age and based on the risk tolerance ability the investment pattern varies. If the investor's need for regular income is high, he will avoid those investments which do not provide any income or provide irregular income until redemption. Hence, need for regular income is also a constraint in meeting investment objectives. If the investor falls in high tax bracket he should avoid those investments which are taxable. Hence, tax liability is also a constraint. Knowing the volatility of returns helps in choosing a particular security but cannot be considered as the constraint in meeting the investment objective. Hence, volatility of returns is not a constraint.

22. Answer : (a)

Reason : Correlation coefficient between two securities measure the relationship between the securities. If this coefficient is positive it indicates the returns on the securities move in the same direction and if it is negative it indicates that the returns on the securities move in the opposite direction. In the question it is given that the correlation coefficient of return on a stock with the returns on the market is negative which indicates that the returns on the stock and the market move in the opposite direction. Hence, (a) is correct.

Risk is measured by variance or beta. Hence, statement (b) cannot be deduced from the given statement. As correlation coefficient shows the relationship of movement of returns on the securities nothing can be deduced about the level of returns. Hence, statement (c) is not correct. Whether a stock is earning above normal, normal or below normal return can be found out by comparing the required rate of return with the expected or average rate of return. Hence, the statements, (d) and (e) are not correct.

23. Answer : (b)

Reason : During later years of the life of the asset, depreciation according to WDV method will be less compared to the amount of depreciation according to SLM method. Hence, switchover from SLM method of depreciation to WDV method during later years of life of the asset will result in lower depreciation, lower cost of sales, higher profits, higher tax liability, higher net fixed assets and lower fixed assets turnover ratio. Hence, (b) is correct and (a), (c) and (e) are not correct. However from the given statement nothing can be said about the current assets. Hence, (d) is also not correct.

24. Answer : (b)

Reason : Value of the bond at 12% interest rate = $\frac{120 + 1000}{1.12} = \text{Rs.}1,000$

Value of the bond at 10% interest rate = $\frac{120 + 1000}{1.10} = \text{Rs.}1018.18$

Capital gains = $1018.18 - 1000 = \text{Rs.}18.18$.

25. Answer : (d)

Reason : The general movement of stock market is usually measured by indices. Generally, indices are used to indicate the broad movements in the securities market. Hence, (d) is correct.

The growth in the secondary market can be measured through the movement in indices. Hence, statement (a) is not correct. As Indices are the tools to help and analyse the movement of prices of various stocks listed on the stock exchanges, they cannot indicate the quantum of investments by different investors. Hence, statement (b) and (c) are not correct. Indices show the movement of market but do not predict the prices of the share. Hence, they do not help in finding out the gain or loss from investment in a particular security. Thus, statement (e) is not correct.

26. Answer : (a)

Reason : Beta of stock = $\frac{\text{Change in stock returns}}{\text{Change in market returns}}$

In the given case, Beta of 's' = $\frac{4\%}{4\%} = 1$

Alternatively it can be worked out as:

As the stock is in equilibrium,

$$r_i = r_f + \beta(r_m - r_f)$$

$$\text{i.e. } 0.16 = r_f + \beta(0.08 - r_f) \dots (1)$$

with the change in economic condition, the new equation will be:

$$0.2 = r_f + \beta(0.12 - r_f) \dots (2)$$

Subtracting (1) from (2) we get

$$0.04 = 0.04 \beta$$

$$\beta = 1.$$

27. Answer : (d)

Reason : Warrants are instruments that entitle the holder to subscribe to the shares of the company that issued the warrant at the end or within the time period specified. An option is a contract in which the seller or the writer of the option grants the buyer or the holder of the option the right to purchase from or sell to the seller a designated instrument or an asset at a specific price. Thus, warrants are created by the company if it wishes to and options can be entered by any two persons intending to enter into the contract. Hence, (a) is correct. As warrants gives the right to the holder to subscribe to the shares exercising of warrants results in an increase in the number of shares outstanding. However, an exercise of the option will not have any effect on the company involved. Hence, (b) is also correct. Both options and warrants can be traded on the market. Hence, c is not correct. Hence, (d) is the answer.

28. Answer : (b)

Reason : Current value of the share = $\frac{\text{Expected dividend a year hence}}{\text{Required rate of return} - \text{Growth rate in dividends}}$

$$\begin{aligned} \text{In the given case, dividend a year hence} &= \text{EPS} \times \text{Dividend payout} \\ &= 18 \times 0.3 = \text{Rs.}5.4 \end{aligned}$$

Required rate of return = 0.25

$$\text{Growth rate (as payout ratio remains constant)} = \text{Growth rate in EPS} = \frac{18}{16} - 1 = 12.5\%$$

$$\text{Value of the share} = \frac{5.4}{0.25 - 0.125} = \text{Rs.}43.2.$$

29. Answer : (d)

Reason : Default risk is the risk of not able to receive the redemption amount. If depends on the ability and inflation of the issuer. Hence, (d) is not the risk due to changes in interest rates.

Reinvestment risk is the risk of not able to reinvest the coupon payment at the YTM (as assumed while calculating the YTM). If there is any change in interest rate, the holder of the bond will not be able to issue at the promised yield and will not be able to earn the promised yield. Hence, (a) is the risk faced by the holder due to changes in interest rates. Price risk is the risk that the price changes due to changes in interest rates. Hence, (b) is also the risk faced due to change in interest rates. Call risk is the risk that the bond may be called by the issuer. The issuer may call the bond if there is a fall in interest rates because the issuer can replace high interest rate bonds with lower interest bonds. Hence, call risk is also faced by the investor due to changes in interest rates. Hence (d) is the answer.

30. Answer : (b)

$$\begin{aligned} \text{Reason : Public offering price} &= \frac{\text{NAV}}{1 - \text{Sales charge}} \\ &= \frac{(2084.52 + 162.88 + 47.74 + 573.23 - 488.56 - 112.92) / 160}{1 - 0.025} \\ &= \frac{14.168}{0.975} = \text{Rs.}14.53. \end{aligned}$$

Part B : Problems

1. To test the independence of the prices we require

Total number of price changes = r

No. of positive price changes = n_1

No. of negative price changes = n_2

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

$$m_r = \frac{2n_1n_2}{n_1 + n_2} + 1 \quad \sigma_r = \left[\frac{2n_1n_2(2n_1n_2 - n_1 - n_2)}{(n_1 + n_2)^2(n_1 + n_2 - 1)} \right]^{1/2}$$

Date	Closing Value of the Sensex	Sign of Price Changes
2 May	3,372.56	
3 May	3,380.61	+
6 May	3,384.35	+
7 May	3,423.75	+
8 May	3,435.06	+
9 May	3,462.01	+
10 May	3,431.32	-
13 May	3,442.49	+
14 May	3,420.33	-
15 May	3,395.59	-
16 May	3,355.61	-
17 May	3,333.76	-
20 May	3,282.81	-
21 May	3,186.53	-
22 May	3,175.49	-
23 May	3,114.05	-
24 May	3,255.62	+
27 May	3,243.41	-
28 May	3,146.83	-
29 May	3,160.24	+
30 May	3,149.25	-

Total number of price changes, $r = 8$

No. of positive price changes $n_1 = 8$

No. of negative price changes, $n_2 = 12$

$$m_r = \frac{2 \times 8 \times 12}{8 + 12} + 1 = \frac{192}{20} + 1 = 10.6$$

$$\begin{aligned} \sigma_r &= \left(\frac{(2 \times 8 \times 12)(2 \times 8 \times 12 - 8 - 12)}{(8 + 12)^2(8 + 12 - 1)} \right)^{1/2} = \left(\frac{192(192 - 20)}{(400)(19)} \right)^{1/2} = \left(\frac{192 \times 172}{7600} \right)^{1/2} = (4.3453)^{1/2} \\ &= 2.08453 \end{aligned}$$

Two tailed test are employed to test the randomness of the sensex movements.

At a significance level of 5% using t table at 19 degrees of freedom

$$\text{The lower limit} = 10.6 - 2.093 \times 2.0845 = 6.237$$

$$\text{The upper limit} = 10.6 + 2.093 \times 2.0845 = 14.963$$

At significance level of 10%, using t table at 19 degrees of freedom

$$\text{The lower limit} = 10.6 - 1.729 \times 2.0845 = 6.995$$

$$\text{The upper limit} = 10.6 + 1.729 \times 2.0845 = 14.204$$

As r lies between these two limits, it confirms that Indian Stock Market indicates the weak form of market efficiency.

2. a. Duration of outflows:

Year	Cash outflow Rs.	PVIF @ 14%	PV Rs.	Proportion of (4) in total PV	(1) × (5)
(1)	(2)	(3)	(4)	(5)	
3	40,000	0.675	27,000	0.301	0.903
4	40,000	0.592	23,680	0.264	1.056
5	40,000	0.519	20,760	0.232	1.160
6	40,000	0.456	18,240	0.203	1.218
			89,680		4.337

Duration of Bond A:

As it is zero coupon bond, its duration is equal to years to maturity = 6 years.

Duration of Bond B:

YTM is ' r_d ' in the following:

$$120 \text{ PVIFA}_{r_d, 5} + 1000 \text{ PVIFA}_{r_d, 5} = \text{Rs.} 930.90$$

If r_d is 14%, LHS = Rs.930.96

Approximately, r_d is 14%

$$r_c = \text{current yield} = \frac{120}{930.90} = 12.89\%$$

$$\begin{aligned} \text{Duration} &= \frac{r_c}{r_d} \text{PVIFA}_{r_d, n} (1 + r_d) + \left[1 - \frac{r_c}{r_d} \right] n \\ &= \frac{0.1289}{0.14} \text{PVIFA}_{(14, 5)} (1.14) + \left[1 - \frac{0.1289}{0.14} \right] \times 5 \\ &= 4 \text{ years (approx.)} \end{aligned}$$

To immunize the payments, duration of investment = Duration of liabilities

Let proportion of funds to be invested in Bond A be x. Then, the duration of investment

$$= x \times 6 + (1 - x) 4$$

As duration of investment = Duration of liabilities

$$6x - 4x + 4 = 4.337$$

$$x = 16.85\% = 17\% \text{ nearly}$$

Proportion of funds in Bond A = 17% and Bond B = 83%

b. Duration of liabilities after 2 years:

Year	Cash outflow Rs.	PVIF @ 14%	PV Rs.	Proportion of (4) in total PV	(1) × (5)
(1)	(2)	(3)	(4)	(5)	(6)
1	40,000	0.877	35,080	0.301	0.301
2	40,000	0.769	30,760	0.264	0.528
3	40,000	0.675	27,000	0.232	0.696
4	40,000	0.592	23,680	0.203	0.812
			1,16,520		2.337

Duration of Bond A = 4 years

Duration of Bond B :

$$\text{Market price at the end of 2 years} = 120 \text{ PVIFA}_{14, 3} + 1000 \text{ PVIF}_{14, 3} = 953.64$$

$$r_d = 14\% ; r_c = \frac{120}{953.64} = 12.58\%$$

$$D = \frac{0.1258}{0.14} \text{PVIFA}_{14, 3} (1.14) + \left[1 - \frac{0.1258}{0.14} \right] \times 3 = 2.683 \text{ years.}$$

$$\begin{aligned} \text{Weighted duration of the portfolio of investment} &= 0.17 \times 4 + 0.83 \times 2.683 \\ &= 2.907 \text{ years.} \end{aligned}$$

As duration of liabilities is not equal to duration of assets the portfolio is not perfectly immunized and has to be changed.

3. a.

Trading Day	6	7	8	9	10	11	12
Closing price (a)	310	330	300	300	280	260	280
Lowest price during the 6 day period (b)	270	270	280	250	240	240	240
Highest price during the 6 day period (c)	340	345	345	345	345	345	345
(d) = (a – b)	40	60	20	50	40	20	40
(e) = (c – b)	70	75	65	95	105	105	105
% K = (d)/(e)	0.571	0.8	0.308	0.526	0.381	0.19	0.381

b. %D

Trading Day	6	7	8	9	10	11	12
				0.551	0.504	0.351	0.37

4.

Date	Contract Value	Gain/Loss	Margin Balance (Rs.)	Pay
6-5-2002	167500	1000	26,000	+10,400
7-5-2002	167950	450	26,450	
8-5-2002	165100	–2850	23,600	
9-5-2002	163100	–2000	21,600	
10-5-2002	156100	–7000	14,600	
13-5-2002	155600	–500	24,500	
14-5-2002	153450	–2150	22,350	
15-5-2002	162350	+8900	31,250	

As margin balance on May 10, 2002 falls below maintenance margin of Rs.18,000, Raju has to pay in Rs.10,400 to bring the margin balance equal to initial margin.

5. Intrinsic value of equity at the end of 5th year:

$$\frac{D_6}{k - g_n} = \frac{8 \times 0.3 \times 1.17^5 \times 1.08}{0.14 - 0.08} = \frac{5.683}{0.06} = \text{Rs.}94.72$$

OPTION I : Exchange part B and warrant at the end of 3rd year.

Year	Cash flow	Total flow Rs.
1.	Interest of 100 x 0.12 = Rs.12	12.00
2.	Interest = 50 x 0.12 = Rs.6 Dividend = 8 x 0.3 x 1.17 ² = Rs.3.29	9.29
3.	Interest = 50 x 0.12 = Rs.6 Dividend = 8 x 0.3 x 1.17 ³ = Rs.3.84	9.84
4.	Dividend = 2 [8 x 0.3 x 1.17 ⁴] = 9.00	9.00
5.	Dividend = 2 [8 x 0.3 x 1.17 ⁵] = 10.52 Sale = 2 x 94.72 = Rs.189.44	199.96

$$\begin{aligned} \text{Present value of the total cash flow} &= \frac{12}{1.20} + \frac{9.29}{(1.20)^2} + \frac{9.84}{(1.20)^3} + \frac{9}{(1.20)^4} + \frac{199.96}{(1.20)^5} \\ &= \text{Rs.}106.84 \end{aligned}$$

OPTION II: Retain Part B and let the warrant lapse

Year		
1.	Interest = 12	12
2.	Interest of Rs.6 + Dividend of Rs.3.29	9.29
3.	Interest of Rs.6 + Dividend of Rs.3.84	9.84
4.	Interest of Rs.6 + Dividend of Rs.4.5	10.50
5.	Interest of Rs.6 + Dividend of Rs.5.26 + Redemption of Rs. 50 + Sale of share Rs.94.72	155.98

$$\frac{12}{1.20} + \frac{9.29}{(1.20)^2} + \frac{9.84}{(1.20)^3} + \frac{10.5}{(1.20)^4} + \frac{155.98}{(1.20)^5} = \text{Rs.89.88}$$

As the intrinsic value of Bond I in Option I is more than FV of Rs.100, investment should be made in the bond and exchange part B and warrant at the end of third year.

6. Market

R_M	P_i	$R_M P_i$	$R_M - E(R_M)$	$[R_M - E(R_M)]^2$	Square of deviations $\times P_i$
-0.07	0.25	-0.0175	-0.2045	0.0418	0.01050
0.12	0.10	0.0120	-0.0145	0.0002	0.00002
0.20	0.45	0.0900	0.0655	0.0043	0.00190
0.25	0.20	0.0500	0.1155	0.0133	0.00270
		0.1345			0.01512

Expected Return on market = 13.45

$\text{Var}_M = 0.01512$

$\sigma_M = 12.30\%$

Stock A

R_A (1)	P_i (2)	$R_A P_i$ (3)	$R_A - E(R_A)$ (4)	$R_M - E(R_M)$ (5)	Product (6) = (4) $\times$ (5)	Product $\times P_i$ (7) = (6) $\times$ (2)
- 0.15	0.25	-0.0375	-0.319	-0.2045	0.0652	0.0163
0.19	0.10	0.0190	0.021	-0.0145	-0.0003	-0.00003
0.35	0.45	0.1575	0.181	0.0655	0.0119	0.0054
0.15	0.20	0.0300	-0.019	0.1155	-0.0022	-0.00043
		0.1690				0.02124

Expected return on stock A = $\Sigma R_A P_i = 16.9\%$

Stock B

R_B (1)	P_i (2)	$R_B P_i$ (3)	$R_B - E(R_B)$ (4)	$R_M - E(R_M)$ (5)	Product (6) = (4) $\times$ (5)	Product $\times P_i$ (7) = (6) $\times$ (2)
-0.08	0.25	-0.0200	-0.2035	-0.2045	0.0416	0.01040
-0.05	0.10	-0.0050	-0.1735	-0.0145	0.0025	0.00025
0.25	0.45	0.1125	0.1265	+0.0655	0.0083	0.00370
0.18	0.20	0.0360	0.0565	0.1155	0.0065	0.00130
		0.1235				0.01565

Expected Return on Stock B = $\Sigma R_B P_i = 12.35\%$

$$\text{Beta}_A = \frac{\text{Cov}_{AM}}{\text{Var}_M} = \frac{[(R_A - E(R_A))][R_M - E(R_M)]P_i}{\text{Var}_M} = \frac{0.02124}{0.01512} = 1.40$$

$$\text{Beta}_B = \frac{\text{Cov}_{BM}}{\text{Var}_M} = \frac{0.01565}{0.01512} = 1.04$$

$$\begin{aligned} \text{b. } R_A &= R_f + \beta_A (R_M - R_f) \\ &= 7 + 1.4 (13.45 - 7) \\ &= 16.03 \end{aligned}$$

$$\begin{aligned} \alpha_A &= E(R_A) - \text{Required return} \\ &= 16.9 - 16.03 = 0.87 \end{aligned}$$

As alpha is positive, Stock A is under valued

$$\begin{aligned} R_B &= 7 + 1.04 (13.45 - 7) \\ &= 13.71 \end{aligned}$$

$$\alpha_B = 12.35 - 13.71 = -1.36$$

As alpha is negative, Stock B is overvalued.

Part C: Applied Theory

7. An understanding of economic forces that affect stock prices facilitates forecasting likely changes in the market by using data on the economic variables.

The important economic forecasting techniques are (a) Lead Indicator Approach, (b) Diffusion Indices, (c) Econometric Model Building and (d) GNP Model Building.

Lead Indicator Approach

The lead indicator approach attempts to forecast the general economic conditions by identifying economic indicators that turn ahead of the change in the general level of economic activity. Economic indicators are nothing but time series which tend to turn up or down in advance of or concurrent with, or after the economic upturn or downturn. So, to forecast the change in the economic conditions, we will be obviously interested in leading indicators because they provide advance signals of the turning points in the economic activity.

While identifying a lead indicator for the purposes of forecasting, the analyst must ensure that the lead indicator should move smoothly from one period to another as it rises or falls and should turn sharply at its peaks and troughs. An ideal lead indicator should always lead turning points of general business activity by the same number of months with no 'false' leads. It should lead by enough time to permit the user to make necessary alterations in his plans, but do not lead by a long-time interval that will make him disbelieve the indicator. The indicator should fit logically with the business cycle theory.

Some of the leading economic indicators are the utilization of manufacturing capacity, residential construction, corporate profits, and of course the general level of stock prices.

The lead indicator approach is most valuable in suggesting the direction of change in economic activity. But it does not convey any information on the magnitude and duration of the change. The other important limitation of this approach is that the signals provided by the different lead indicators can be mixed. In other words, some of the leading series might signal a turn while the others might not, resulting in a serious problem of interpreting the same for the purpose of arriving at a forecast.

Diffusion Indices

A diffusion index (as the name implies) is a measure of how widespread (diffused) a phenomenon is. We can set up a diffusion index for leading indicators by counting the number of indicators that rise during a particular period and expressing it as a proportion of the total number of lead indicators and more desirably in a percentage form. If five out of, say, ten leading indicators rise during a particular month, the diffusion index for that month will be 50 percent. If, in the next month, seven rise (not necessarily including all the five which rose in the previous month), the index for that month will be 70 percent. The user must interpret the diffusion index relative to the levels of the index in the past. Certainly a rise from 50% to 70% in the index is a stronger confirmation of a period of economic advance.

Econometric Model Building Approach

As far as short-term economic forecasting is concerned, an approach based on econometric methods has the advantage of providing a magnitude and direction to the dependent variable (unlike the lead indicator approach), say GNP. However, the user must understand that a precise estimate of the dependent variable (forecast value for GNP) obtained from the econometric model need not be an accurate one, because accuracy of the forecast will ultimately depend upon the quality of data input, the validity of the assumptions underlying the model, and above all upon the model builder's understanding of the underlying economic theory.

Econometric models can be meaningful for future projections if and only if the estimated co-efficients (like the intercept 'a' and slope 'b' in a linear regression model) are found to be acceptable in respect of their stability over time.

GNP Model Building Approach

The GNP model building approach forecasts GNP in the short-run by estimating the magnitudes of the various components constituting GNP. If GNP is defined as $C + I + G + X - M$ where C, I, G, X and M stand for their standard definitions, then forecast for GNP under this approach is determined by estimating the likely values of C, I, G, X and M. To estimate these components, the forecaster relies extensively on the budget estimates of the Central and State Governments, the socio-economic surveys carried out by the Government and private agencies, and the field data collected for this purpose.

Once the forecaster estimates these major components, he adds them together to come up with his estimate of the GNP. He tests the forecast for internal consistency because of the interrelatedness of the GNP accounts. For example, a given level of consumption implies a certain level of savings, which affects business investments which in turn affects production activities, and thus affects income and savings.

While these circular effects take place, other factors like interest rates and inflation will also be affected. So, the forecaster must ensure that his estimates for the different components take care of such interlinkage. Apart from testing the forecast for internal consistency, the forecaster also examines it for external consistency by comparing it with forecasts obtained under other methods like the econometric model building approach.

The major advantage of this approach is its versatility. Since the GNP forecast is adjusted for all anticipated changes and tested for internal consistency, it is likely to be reliable one. But the approach is data demanding and calls for a vast deal of judgment and ingenuity.

8. The extent of a trend is monitored by breadth. Breadth refers to the extent to which share issues move along with the market trend and is generally measured in terms of number of issues whose prices are advancing, declining, and remaining unaltered in the period over which a trend persists. A reversal in trend is imminent if the number of issues moving with the trend are fewer than those moving against. Breadth also measures the underlying strength of the market. If the index continues to move up, a reversal can be read from the breadth of the market statistics. In other words, if a price trend does not receive a follow up from the broad market, it is vulnerable, and may not persist for long.

Numerous methods exist for measuring the breadth of the market. One of the simplest is to compare the number of issues whose prices advanced on a particular day, to the number of issues whose prices declined on a particular day, to the number of issues whose prices remained unaltered on the same day. The net advances or declines thus obtained, is cumulated over the period under observation. The cumulated figures are also plotted on a graph, preferably along with a market index. The advance-decline line (A-D line) and the index generally move in tandem. However a divergence in the A-D line is indicative of a turning point, and technical analysts look for such signals from the A-D line.

For example, consider the following table showing net advances or declines for issues traded on the Bombay Stock Exchange, during a certain period.

Table

Day	Issues Traded	Advances	Declines	Net	Cumulative Advances/Declines
	(1)	(2)	(3)	(4)	(5)
25 Nov. '98	1318	454	686	-232	-232
26	1392	417	811	-394	-626
27	1403	344	841	-497	-1123
28	1392	417	811	-394	-1517
1 Dec. '98	1008	480	385	95	-1422
2	1219	538	483	55	-1367
3	1306	514	601	-87	-1454
4	1226	434	620	-186	-1640
5	1306	514	601	-87	-1727
8	1141	641	366	275	-1452

The breadth of the market statistics in the last column is simply cumulative value of net advances or declines. The value becomes negative when number of declines exceed the number of advances. This in itself need not cause concern, because the value of the cumulative advances/declines depend on the value obtaining on the first data from which observations were made. However, the change in direction of the breadth statistics is to be noted. It is the direction of the statistics that is more important than the magnitude.

The A-D line drawn from a simple cumulation of the net advances or declines is generally used to observe the breadth of the market over short periods of a month or two. For long run observations, the A-D line is drawn after considering the number of issues also whose prices remain unaltered. The A-D line is drawn by cumulating the value of $\sqrt{(A/u) - (D/u)}$, where A = number of stocks whose prices are advancing; D = number of stocks whose prices are declines; and u = number of stocks whose prices remain unaltered.

Inclusion of the issues whose prices remain unaltered provides additional information on the market following for a certain trend, and can also indicate in advance, a trend reversal. If the trend to advance or decline is very strong, the number of unchanged issue should diminish. By giving weightage to such stocks in computing the A-D line, any slow down in the momentum of the A-D line can be gauged earlier, because extreme movements would be restrained by an increasing number of unchanged issues.

The utility of the A-D line in this context lies in its movement as compared to a market average. The divergence of the A-D line from the market index provides vital clues on the future course the market is expected to take. Technical analysts, therefore, attach a lot of value to the divergence of A-D line from the market index.

The following principles of divergence have been found to universally apply:

- i. In a bull market the A-D line generally peaks ahead of the market index. Two important reasons behind this phenomenon are:
 - a. The market, as a whole, discounts the business cycle, and generally attains the peak atleast 6 to 9 months before the economy peaks out. However, certain leading sectors like consumer durables peak out earlier than the business cycle. Stocks representing such sectors, therefore, will logically peak out ahead of the market.
 - b. At the end of a bull market, it is observed that the stocks of the Blue Chip companies are the last to be unloaded. Since most indices include many Blue Chip stocks, it is natural for the A-D line to peak out before the indices, which may continue to rise even after the broad market has peaked out.
- ii. The longer and greater the divergence, the implied reversal may be expected to be deeper and more substantial. The converse of this principle is not always true. That is every bear market need not necessarily be preceded by a divergence.
- iii. At market bottoms, the A-D line generally coincides with, or lags behind the market index and has no forecasting significance until its downtrend reversal is signaled by a breakout from a price pattern. However, where the A-D line persistently refuses to confirm a new low in the market index, a downtrend reversal is imminent.

Technical analysts always confirm whether the A-D line has made that final advance by waiting for a downside trendline penetration or a moving average crossover.