

Security Analysis

BASIC CONCEPTS AND FORMULAE

1. **Introduction:** Security Analysis stands for the proposition that a well-disciplined investor can determine a rough value for a company from all of its financial statements, make purchases when the market inevitably under-prices some of them, earn a satisfactory return, and never be in real danger of permanent loss.
2. **Approaches of Security Analysis:** There are basically two main approaches of security analysis- Fundamental analysis and Technical analysis.
3. **Fundamental Analysis:** Fundamental analysis is based on the assumption that the share prices depend upon the future dividends expected by the shareholders. The present value of the future dividends can be calculated by discounting the cash flows at an appropriate discount rate and is known as the '*intrinsic value of the share*'. The intrinsic value of a share, according to a fundamental analyst, depicts the true value of a share. A share that is priced below the intrinsic value must be bought, while a share quoted above the intrinsic value must be sold.
4. **Models of Fundamental Analysis**

(a) Dividend Growth Model

$$P(0) = \frac{D(0)(1+g)}{(k - g)}$$

Where,

P(0) = Price of Share

D(0) = Current Dividend

g = Growth Rate

k = Cost of Equity

(b) Dividend Growth Model and the PE Multiple

$$P(0) = \frac{bE(0)(1+g)}{(k - g)}$$

Where,

b = Dividend Pay-out fraction or ratio

E(0) = Current EPS

5. **Types of Fundamental Analysis:** There are three types of fundamental analysis- Economic analysis, Industry analysis and Company analysis.
6. **Economic Analysis:** Macro- economic factors e. g. historical performance of the economy in the past/ present and expectations in future, growth of different sectors of the economy in future with signs of stagnation/degradation at present to be assessed while analyzing the overall economy. Trends in peoples' income and expenditure reflect the growth of a particular industry/company in future. Consumption affects corporate profits, dividends and share prices in the market.
7. **Factors Affecting Economic Analysis:** Some of the economy wide factors are as under:
 - (a) Growth Rates of National Income and Related Measures
 - (b) Growth Rates of Industrial Sector
 - (c) Inflation
 - (d) Monsoon
8. **Techniques Used For Economic Analysis**
 - (i) **Anticipatory Surveys:** They help investors to form an opinion about the future state of the economy.
 - (ii) **Barometer/Indicator Approach:** Various indicators are used to find out how the economy shall perform in the future.
 - (iii) **Economic Model Building Approach:** In this approach, a precise and clear relationship between dependent and independent variables is determined.
9. **Industry Analysis:** An assessment regarding all the conditions and factors relating to demand of the particular product, cost structure of the industry and other economic and government constraints have to be done.
10. **Factors Affecting Industry Analysis:** The following factors may particularly be kept in mind while assessing the factors relating to an industry :
 - (a) Product Life-Cycle;
 - (b) Demand Supply Gap;
 - (c) Barriers to Entry;
 - (d) Government Attitude;
 - (e) State of Competition in the Industry;
 - (f) Cost Conditions and Profitability and
 - (g) Technology and Research.

11. Techniques Used For Industry Analysis

- (a) **Regression Analysis:** Investor diagnoses the factors determining the demand for output of the industry through product demand analysis.
- (b) **Input – Output Analysis:** It reflects the flow of goods and services through the economy, intermediate steps in production process as goods proceed from raw material stage through final consumption.

12. Company Analysis: Economic and industry framework provides the investor with proper background against which shares of a particular company are purchased. This requires careful examination of the company's quantitative and qualitative fundamentals.

13. Techniques Used in Company Analysis

- (a) **Correlation & Regression Analysis:** Simple regression is used when inter relationship covers two variables. For more than two variables, multiple regression analysis is followed.
- (b) **Trend Analysis:** The relationship of one variable is tested over time using regression analysis. It gives an insight to the historical behavior of the variable.
- (c) **Decision Tree Analysis:** In decision tree analysis, the decision is taken sequentially with probabilities attached to each sequence. To obtain the probability of final outcome, various sequential decisions are given along with probabilities, then probabilities of each sequence is to be multiplied and then summed up.

14. Technical Analysis: Technical analysis is a method of share price movements based on a study of price graphs or charts on the assumption that share price trends are repetitive, that since investor psychology follows a certain pattern, what is seen to have happened before is likely to be repeated.

15. Types of Charts

- (i) **Bar Chart :** In a bar chart, a vertical line (bar) represents the lowest to the highest price, with a short horizontal line protruding from the bar representing the closing price for the period.
- (ii) **Line Chart:** In a line chart, lines are used to connect successive day's prices. The closing price for each period is plotted as a point. These points are joined by a line to form the chart. The period may be a day, a week or a month.
- (iii) **Point and Figure Chart:** Point and Figure charts are more complex than line or bar charts. They are used to detect reversals in a trend.

16. General Principles and Methods of Technical Analysis: Certain principles underlying the technical analysis need to be understood and correlated with the tools and techniques of technical analysis. Interpreting any one method in isolation would not result in depicting the correct picture of the market.

17. The Dow Theory: The Dow Theory is based upon the movements of two indices,

constructed by Charles Dow, Dow Jones Industrial Average (DJIA) and Dow Jones Transportation Average (DJTA). These averages reflect the aggregate impact of all kinds of information on the market. The movements of the market are divided into three classifications, all going at the same time; the primary movement, the secondary movement, and the daily fluctuations. The primary movement is the main trend of the market, which lasts from one year to 36 months or longer. This trend is commonly called bear or bull market. The secondary movement of the market is shorter in duration than the primary movement, and is opposite in direction. It lasts from two weeks to a month or more. The daily fluctuations are the narrow movements from day-to-day.

18. Market Indicators

- (i) **Breadth Index:** It is an index that covers all securities traded. It is computed by dividing the net advances or declines in the market by the number of issues traded. The breadth index either supports or contradicts the movement of the Dow Jones Averages. If it supports the movement of the Dow Jones Averages, this is considered sign of technical strength and if it does not support the averages, it is a sign of technical weakness i.e. a sign that the market will move in a direction opposite to the Dow Jones Averages.
- (ii) **Volume of Transactions:** The volume of shares traded in the market provides useful clues on how the market would behave in the near future. A rising index/price with increasing volume would signal buy behaviour because the situation reflects an unsatisfied demand in the market. Similarly, a falling market with increasing volume signals a bear market and the prices would be expected to fall further. A rising market with decreasing volume indicates a bull market while a falling market with dwindling volume indicates a bear market. Thus, the volume concept is best used with another market indicator, such as the Dow Theory.
- (iii) **Confidence Index:** It is supposed to reveal how willing the investors are to take a chance in the market. It is the ratio of high-grade bond yields to low-grade bond yields. It is used by market analysts as a method of trading or timing the purchase and sale of stock, and also, as a forecasting device to determine the turning points of the market. A rising confidence index is expected to precede a rising stock market, and a fall in the index is expected to precede a drop in stock prices. A fall in the confidence index represents the fact that low-grade bond yields are rising faster or falling more slowly than high grade yields. The confidence index is usually, but not always a leading indicator of the market. Therefore, it should be used in conjunction with other market indicators.
- (iv) **Relative Strength Analysis:** The relative strength concept suggests that the prices of some securities rise relatively faster in a bull market or decline more slowly in a bear market than other securities i.e. some securities exhibit relative strength. Investors will earn higher returns by investing in securities which have demonstrated relative strength in the past because the relative strength of a security

tends to remain undiminished over time.

Relative strength can be measured in several ways. Calculating rates of return and classifying those securities with historically high average returns as securities with high relative strength is one of them. Even ratios like security relative to its industry and security relative to the entire market can also be used to detect relative strength in a security or an industry.

- (v) **Odd - Lot Theory:** This theory is a contrary - opinion theory. It assumes that the average person is usually wrong and that a wise course of action is to pursue strategies contrary to popular opinion. The odd-lot theory is used primarily to predict tops in bull markets, but also to predict reversals in individual securities.

19. Support and Resistance Levels: When the index/price goes down from a peak, the peak becomes the resistance level. When the index/price rebounds after reaching a trough subsequently, the lowest value reached becomes the support level. The price is then expected to move between these two levels. Whenever the price approaches the resistance level, there is a selling pressure because all investors who failed to sell at the high would be keen to liquidate, while whenever the price approaches the support level, there is a buying pressure as all those investors who failed to buy at the lowest price would like to purchase the share. A breach of these levels indicates a distinct departure from status quo, and an attempt to set newer levels.

20. Interpreting Price Patterns

- (a) **Channel:** A series of uniformly changing tops and bottoms gives rise to a channel formation. A downward sloping channel would indicate declining prices and an upward sloping channel would imply rising prices.
- (b) **Wedge:** A wedge is formed when the tops (resistance levels) and bottoms (support levels) change in opposite direction (that is, if the tops, are decreasing then the bottoms are increasing and vice versa), or when they are changing in the same direction at different rates over time.
- (c) **Head and Shoulders:** It is a distorted drawing of a human form, with a large lump (for head) in the middle of two smaller humps (for shoulders). This is perhaps the single most important pattern to indicate a reversal of price trend. The neckline of the pattern is formed by joining points where the head and the shoulders meet. The price movement after the formation of the second shoulder is crucial. If the price goes below the neckline, then a drop in price is indicated, with the drop expected to be equal to the distance between the top of the head and the neckline.
- (d) **Triangle or Coil Formation:** This formation represents a pattern of uncertainty and is difficult to predict which way the price will break out.
- (e) **Flags and Pennants Form:** This form signifies a phase after which the previous price trend is likely to continue.

- (f) **Double Top Form:** This form represents a bearish development, signals that price is expected to fall.
- (g) **Double Bottom Form:** This form represents bullish development signaling price is expected to rise.
- (h) **Gap:** A gap is the difference between the opening price on a trading day and the closing price of the previous trading day. Wider the gap, stronger is the signal for a continuation of the observed trend. On a rising market, if the opening price is considerably higher than the previous closing price, it indicates that investors are willing to pay a much higher price to acquire the scrip. Similarly, a gap in a falling market is an indicator of extreme selling pressure.

21. **Decision Using Moving Averages:** Moving averages are frequently plotted with prices to make buy and sell decisions. The two types of moving averages used by chartists are the Arithmetic Moving Average (AMA) and the Exponential Moving Average (EMA).

Buy and Sell Signals Provided by Moving Average Analysis

Buy Signal	Sell Signal
(a) Stock price line rise through the moving average line when graph of the moving average line is flattening out.	(a) Stock price line falls through moving average line when graph of the moving average line is flattening out.
(b) Stock price line falls below moving average line which is rising.	(b) Stock price line rises above moving average line which is falling.
(c) Stock price line which is above moving average line falls but begins to rise again before reaching the moving average line	(c) Stock price line which is slow moving average line rises but begins to fall again before reaching the moving average line.

22. **Bollinger Bands:** A band is plotted two standard deviations away from a simple moving average. Because standard deviation is a measure of volatility, Bollinger bands adjust themselves to the market conditions. When the markets become more volatile, the bands widen (move further away from the average), and during less volatile periods, the bands contract (move closer to the average). The tightening of the bands is often used by technical traders as an early indication that the volatility is about to increase sharply.
23. **Momentum Analysis:** Momentum measures the speed of price change and provides a leading indicator of changes in trend. The momentum line leads price action frequently enough to signal a potential trend reversal in the market.
24. **Bond Valuation:** A bond or debenture is an instrument of debt issued by a business or government.

- (a) **Par Value:** Value stated on the face of the bond. It is the amount a firm borrows and promises to repay at the time of maturity.
- (b) **Coupon Rate and Interest:** A bond carries a specific interest rate known as the coupon rate. The interest payable to the bond holder is par value of the bond × coupon rate.
- (c) **Maturity Period:** Corporate bonds have a maturity period of 3 to 10 years. While government bonds have maturity periods extending up to 20-25 years. At the time of maturity the par (face) value plus nominal premium is payable to the bondholder.

25. Bond Valuation Model

Value of a bond is:

$$V = \sum_{t=1}^n \frac{I}{(1+k_d)^t} + \frac{F}{(1+k_d)^n}$$

$$V = I(PVIFA_{k_d, n}) + F(PVIF_{k_d, n})$$

Where,

V = Value of the bond

I = Annual interest payable on the bond

F = Principal amount (par value) of the bond repayable at the time of maturity

n = Maturity period of the bond.

Value of a bond with semi-annual interest is:

$$V = \sum_{t=1}^{2n} \left[\frac{I/2}{(1+k_d/2)^t} \right] + \frac{F}{(1+k_d/2)^{2n}}$$

$$= I/2(PVIFA_{k_d/2, 2n}) + F(PVIF_{k_d/2, 2n})$$

Where,

V = Value of the bond

I/2 = Semi-annual interest payment

K_d/2 = Discount rate applicable to a half-year period

F = Par value of the bond repayable at maturity

2n = Maturity period expressed in terms of half-yearly periods.

- 26. **Price Yield Relationship:** As the required yield increases, the present value of the cash flow decreases; hence the price decreases. Conversely, when the required yield decreases, the present value of the cash flow increases, hence the price increases.
- 27. **Relationship between Bond Price and Time:** Since the price of a bond must be equal to its par value at maturity (assuming that there is no risk of default), bond price

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changes with time.

- 28. Yield Curve:** It shows how yield to maturity is related to term to maturity for bonds that are similar in all respects, except maturity.

$$\text{Discount at the yield to maturity : } (R_t) \text{ PV [CF(t)]} = \frac{CF(t)}{(1+R_t)^t}$$

Discount by the product of a spot rate plus the forward rates :

$$\text{PV [CF(t)]} = \frac{CF(t)}{(1+r_1)(1+r_2) \dots (1+r_t)}$$

Question 1

Explain the Efficient Market Theory in and what are major misconceptions about this theory?

Answer

In 1953, Maurice Kendall a distinguished statistician of the Royal Statistical Society, London examined the behaviour of the stock and commodity prices in search of regular cycles instead of discovering any regular price cycle. He found each series to be “wandering one, almost as if once a week, the Demon of Chance drew a random number and added it to the current price to determine next week’s price”.

Prices appeared to follow a random walk implying that successive price changes are independent of one another. In 1959 two interesting papers supporting the Random Walk Theory were published. Harry Roberts showed that a series obtained by cumulating random numbers bore resemblance to a time series of stock prices. In the second, Osborne, an eminent physicist, examined that the stock price behavior was similar to the movements of very small particles suspended in a liquid medium. Such movement is referred to as the Brownian motion. He found a remarkable similarity between stock price movements and the Brownian motion.

Inspired by the works of Kendall, Roberts & Osborne, a number of researchers employed indigenous tests of randomness on stock price behaviour. By and large, these tests have indicated the Random Walk hypothesis.

Search for Theory: When empirical evidence in favour of Random walk hypothesis seemed overwhelming, researchers wanted to know about the Economic processes that produced a Random walk. They concluded that randomness of stock price was a result of efficient market that led to the following view points:

- Information is freely and instantaneously available to all market participants.
- Keen competition among the market participants more or less ensures that market will reflect intrinsic values. This means that they will fully impound all available information.
- Price change only response to new information that is unrelated to previous information and therefore unpredictable.

Misconception about Efficient Market Theory: Though the Efficient Market Theory implies that market has perfect forecasting abilities, in fact, it merely signifies that prices impound all available information and as such does not mean that market possesses perfect forecasting abilities.

Although price tends to fluctuate they cannot reflect fair value. This is because the feature is uncertain and the market springs surprises continually as price reflects the surprises they fluctuate.

Inability of institutional portfolio managers to achieve superior investment performance implies that they lack competence in an efficient market. It is not possible to achieve superior investment performance since market efficiency exists due to portfolio managers doing this job well in a competitive setting.

The random movement of stock prices suggests that stock market is irrational. Randomness and irrational are two different things, if investors are rational and competitive, price changes are bound to be random.

Question 2

Explain the different levels or forms of Efficient Market Theory in and what are various empirical evidence for these forms?

Answer

That price reflects all available information, the highest order of market efficiency. According to FAMA, there exist three levels of market efficiency:-

- (i) *Weak form efficiency* – Price reflect all information found in the record of past prices and volumes.
- (ii) *Semi – Strong efficiency* – Price reflect not only all information found in the record of past prices and volumes but also all other publicly available information.
- (iii) *Strong form efficiency* – Price reflect all available information public as well as private.

Empirical Evidence on Weak form Efficient Market Theory: According to the Weak form Efficient Market Theory current price of a stock reflect all information found in the record of past prices and volumes. This means that there is no relationship between the past and future price movements.

Three types of tests have been employed to empirically verify the weak form of Efficient Market Theory- Serial Correlation Test, Run Test and Filter Rule Test.

- (a) *Serial Correlation Test:* To test for randomness in stock price changes, one has to look at serial correlation. For this purpose, price change in one period has to be correlated with price change in some other period. Price changes are considered to be serially independent. Serial correlation studies employing different stocks, different time lags and different time period have been conducted to detect serial correlation but no significant serial correlation could be discovered. These studies were carried on short term trends viz. daily, weekly, fortnightly and monthly and not in long term trends in stock prices as in

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such cases. Stock prices tend to move upwards.

- (b) *Run Test*: Given a series of stock price changes each price change is designated + if it represents an increase and – if it represents a decrease. The resulting series may be -, +, -, -, -, +, +.

A run occurs when there is no difference between the sign of two changes. When the sign of change differs, the run ends and new run begins.

$\frac{++}{1} / \frac{---}{2} / \frac{+-}{3} / \frac{+-}{4} / \frac{+-}{5} / \frac{--}{6} \quad \frac{++}{1} / \frac{---}{2} / \frac{+-}{3} / \frac{+-}{4} / \frac{+-}{5} / \frac{--}{6}$

To test a series of price change for independence, the number of runs in that series is compared with a number of runs in a purely random series of the size and in the process determines whether it is statistically different. By and large, the result of these studies strongly supports the Random Walk Model.

- (c) *Filter Rules Test*: If the price of stock increases by at least N% buy and hold it until its price decreases by at least N% from a subsequent high. When the price decreases at least N% or more, sell it. If the behaviour of stock price changes is random, filter rules should not apply in such a buy and hold strategy. By and large, studies suggest that filter rules do not out perform a single buy and hold strategy particular after considering commission on transaction.

Empirical Evidence on Semi-strong Efficient Market Theory: Semi-strong form efficient market theory holds that stock prices adjust rapidly to all publicly available information. By using publicly available information, investors will not be able to earn above normal rates of return after considering the risk factor. To test semi-strong form efficient market theory, a number of studies was conducted which lead to the following queries: Whether it was possible to earn on the above normal rate of return after adjustment for risk, using only publicly available information and how rapidly prices adjust to public announcement with regard to earnings, dividends, mergers, acquisitions, stocksplits?

Several studies support the Semi-strong form Efficient Market Theory. Fama, Fisher, Jensen and Roll in their adjustment of stock prices to new information examined the effect of stock split on return of 940 stock splits in New York Stock Exchange during the period 1957-1959 They found that prior to the split, stock earns higher returns than predicted by any market model.

Boll and Bound in an empirical evaluation of accounting income numbers studied the effect of annual earnings announcements. They divided the firms into two groups. First group consisted of firms whose earnings increased in relation to the average corporate earnings while second group consists of firms whose earnings decreased in relation to the average corporate earnings. They found that before the announcement of earnings, stock in the first group earned positive abnormal returns while stock in the second group earned negative abnormal returns after the announcement of earnings. Stock in both the groups earned normal returns.

There have been studies which have been empirically documented showing the following inefficiencies and anomalies:

- Stock price adjust gradually not rapidly to announcements of unanticipated changes in quarterly earnings.
- Small firms' portfolio seemed to outperform large firms' portfolio.
- Low price earning multiple stock tend to outperform large price earning multiple stock.
- Monday's return is lower than return for the other days of the week.

Empirical Evidence on Strong form Efficient Market Theory: According to the Efficient Market Theory, all available information, public or private, is reflected in the stock prices. This represents an extreme hypothesis.

To test this theory, the researcher analysed returns earned by certain groups viz. corporate insiders, specialists on stock exchanges, mutual fund managers who have access to internal information (not publicly available), or possess greater resource or ability to intensively analyse information in the public domain. They suggested that corporate insiders (having access to internal information) and stock exchange specialists (having monopolistic exposure) earn superior rate of return after adjustment of risk.

Mutual Fund managers do not on an average earn a superior rate of return. No scientific evidence has been formulated to indicate that investment performance of professionally managed portfolios as a group has been any better than that of randomly selected portfolios. This was the finding of Burton Malkiel in his *Random Walk Down Wall Street*, New York.

Question 3

Explain the different challenges to Efficient Market Theory.

Answer

Information inadequacy – Information is neither freely available nor rapidly transmitted to all participants in the stock market. There is a calculated attempt by many companies to circulate misinformation. Other challenges are as follows:

- (a) Limited information processing capabilities** – Human information processing capabilities are sharply limited. According to Herbert Simon every human organism lives in an environment which generates millions of new bits of information every second but the bottle necks of the perceptual apparatus does not admit more than thousand bits per seconds and possibly much less.

David Dreman maintained that under conditions of anxiety and uncertainty, with a vast interacting information grid, the market can become a giant.

- (b) Irrational Behaviour** – It is generally believed that investors' rationality will ensure a close correspondence between market prices and intrinsic values. But in practice this is not true. J. M. Keynes argued that all sorts of consideration enter into the market

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valuation which is in no way relevant to the prospective yield. This was confirmed by L. C. Gupta who found that the market evaluation processes work haphazardly almost like a blind man firing a gun. The market seems to function largely on hit or miss tactics rather than on the basis of informed beliefs about the long term prospects of individual enterprises.

- (c) **Monopolistic Influence** – A market is regarded as highly competitive. No single buyer or seller is supposed to have undue influence over prices. In practice, powerful institutions and big operators wield great influence over the market. The monopolistic power enjoyed by them diminishes the competitiveness of the market.

Question 4

Explain in detail the Dow Jones Theory?

Answer

As already discussed in the previous chapter, the Dow Jones Theory is probably the most popular theory regarding the behaviour of stock market prices. The theory derives its name from Charles H. Dow, who established the Dow Jones & Co., and was the first editor of the Wall Street Journal – a leading publication on financial and economic matters in the U.S.A. Although Dow never gave a proper shape to the theory, ideas have been expanded and articulated by many of his successors. Let us study the theory once again but in detail.

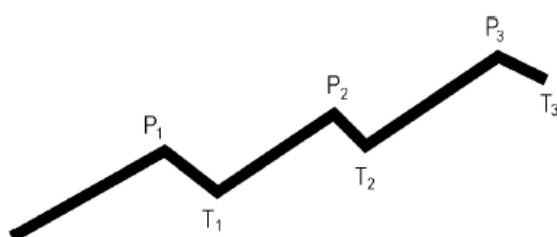
The Dow Jones theory classifies the movements of the prices on the share market into three major categories:

- Primary movements,
- Secondary movements, and
- Daily fluctuations.

- (i) **Primary Movements:** They reflect the trend of the stock market and last from one year to three years, or sometimes even more.

If the long range behaviour of market prices is seen, it will be observed that the share markets go through definite phases where the prices are consistently rising or falling.

These phases are known as bull and bear phases.

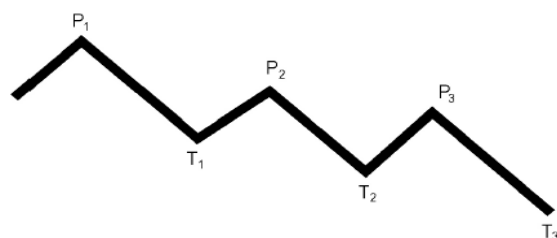


Graph 1

During a bull phase, the basic trend is that of rise in prices. Graph 1 above shows the behaviour of stock market prices in bull phase.

Students would notice from the graph that although the prices fall after each rise, the basic trend is that of rising prices, as can be seen from the graph that each trough prices reach, is at a higher level than the earlier one. Similarly, each peak that the prices reach is on a higher level than the earlier one. Thus P_2 is higher than P_1 and T_2 is higher than T_1 . This means that prices do not rise consistently even in a bull phase. They rise for some time and after each rise, they fall. However, the falls are of a lower magnitude than earlier. As a result, prices reach higher levels with each rise.

Once the prices have risen very high, the bear phase is bound to start, i.e., price will start falling. Graph 2 shows the typical behaviour of prices on the stock exchange in the case of a bear phase. It would be seen that prices are not falling consistently and, after each fall, there is a rise in prices. However, the rise is not much as to take the prices higher than the previous peak. It means that each peak and trough is now lower than the previous peak and trough.



Graph 2

The theory argues that primary movements indicate basic trends in the market. It states that if cyclical swings of stock market price indices are successively higher, the market trend is up and there is a bull market. On the contrary, if successive highs and lows are successively lower, the market is on a downward trend and we are in a bear market. This theory thus relies upon the behaviour of the indices of share market prices in perceiving the trend in the market.

According to this theory, when the lines joining the first two troughs and the lines joining the corresponding two peaks are convergent, there is a rising trend and when both the lines are divergent, it is a declining trend.

- (ii) **Secondary Movements:** We have seen that even when the primary trend is upward, there are also downward movements of prices. Similarly, even where the primary trend is downward, there is an upward movement of prices also. These movements are known as secondary movements and are shorter in duration and are opposite in direction to the primary movements. These movements normally last from three weeks to three months and retrace $1/3$ to $2/3$ of the previous advance in a bull market or previous fall in the bear market.

- (iii) **Daily Movements:** There are irregular fluctuations which occur every day in the market. These fluctuations are without any definite trend. Thus if the daily share market price index for a few months is plotted on the graph it will show both upward and downward fluctuations. These fluctuations are the result of speculative factors. An investment manager really is not interested in the short run fluctuations in share prices since he is not a speculator. It may be reiterated that any one who tries to gain from short run fluctuations in the stock market, can make money only by sheer chance. The investment manager should scrupulously keep away from the daily fluctuations of the market. He is not a speculator and should always resist the temptation of speculating.

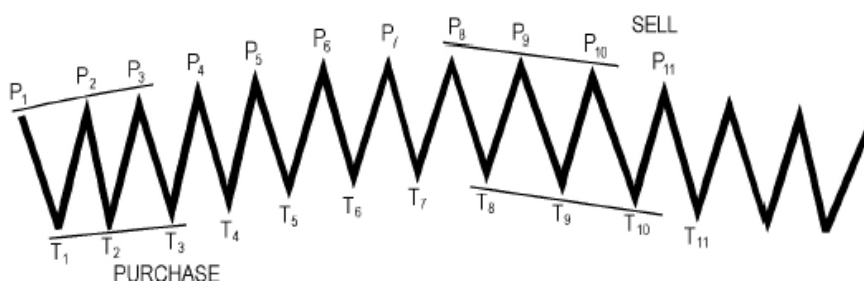
Such a temptation is always very attractive but must always be resisted. Speculation is beyond the scope of the job of an investment manager.

Timing of Investment Decisions on the Basis of Dow Jones Theory : Ideally speaking, the investment manager would like to purchase shares at a time when they have reached the lowest trough and sell them at a time when they reach the highest peak.

However, in practice, this seldom happens. Even the most astute investment manager can never know when the highest peak or the lowest trough has been reached. Therefore, he has to time his decision in such a manner that he buys the shares when they are on the rise and sells them when they are on the fall. It means that he should be able to identify exactly when the falling or the rising trend has begun.

This is technically known as identification of the turn in the share market prices. Identification of this turn is difficult in practice because of the fact that, even in a rising market, prices keep on falling as a part of the secondary movement. Similarly even in a falling market prices keep on rising temporarily. How to be certain that the rise in prices or fall in the same is due to a real turn in prices from a bullish to a bearish phase or vice versa or that it is due only to short-run speculative trends?

Dow Jones theory identifies the turn in the market prices by seeing whether the successive peaks and troughs are higher or lower than earlier. Consider the following graph:



Graph 3

According to the theory, the investment manager should purchase investments when the prices are at T1. At this point, he can ascertain that the bull trend has started, since T2 is higher than T1 and P2 is higher than P1.

Similarly, when prices reach P7 he should make sales. At this point he can ascertain that the bearish trend has started, since P9 is lower than P8 and T8 is lower than T7.

Question 5

Explain the Elliot Wave Theory of technical analysis?

Answer

Inspired by the Dow Theory and by observations found throughout nature, Ralph Elliot formulated Elliot Wave Theory in 1934. This theory was based on analysis of 75 years stock price movements and charts. From his studies, he defined price movements in terms of waves. Accordingly, this theory was named Elliot Wave Theory. Elliot found that the markets exhibited certain repeated patterns or waves. As per this theory wave is a movement of the market price from one change in the direction to the next change in the same direction. These waves are resulted from buying and selling impulses emerging from the demand and supply pressures on the market. Depending on the demand and supply pressures, waves are generated in the prices.

As per this theory, waves can be classified into two parts:-

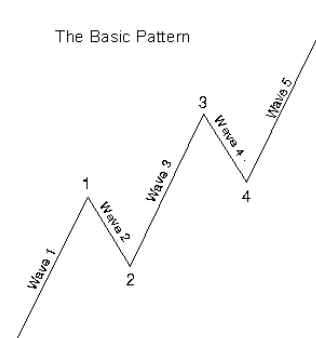
- Impulsive patterns
- Corrective patterns

Let us discuss each of these patterns.

- (a) **Impulsive Patterns-(Basic Waves)** - In this pattern there will be 3 or 5 waves in a given direction (going upward or downward). These waves shall move in the direction of the basic movement. This movement can indicate bull phase or bear phase.
- (b) **Corrective Patterns- (Reaction Waves)** - These 3 waves are against the basic direction of the basic movement. Correction involves correcting the earlier rise in case of bull market and fall in case of bear market.

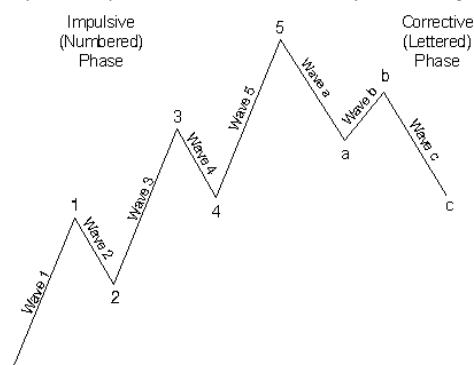
As shown in the following diagram waves 1, 3 and 5 are directional movements, which are separated or corrected by wave 2 & 4, termed as corrective movements.

6.16 Strategic Financial Management



Source: <http://elliottwave.net/>

Complete Cycle - As shown in following figure five-wave impulses is following by a three-wave correction (a, b & c) to form a complete cycle of eight waves.



Source: <http://elliottwave.net/>

One complete cycle consists of waves made up of two distinct phases, bullish and bearish. On completion of full one cycle i.e. termination of 8 waves movement, the fresh cycle starts with similar impulses arising out of market trading.

Question 6

Why should the duration of a coupon carrying bond always be less than the time to its maturity?

Answer

Duration is nothing but the average time taken by an investor to collect his/her investment. If an investor receives a part of his/her investment over the time on specific intervals before maturity, the investment will offer him the duration which would be lesser than the maturity of the instrument. Higher the coupon rate, lesser would be the duration.

Question 7

Mention the various techniques used in economic analysis.

Answer

Some of the techniques used for economic analysis are:

- (a) **Anticipatory Surveys:** They help investors to form an opinion about the future state of the economy. It incorporates expert opinion on construction activities, expenditure on plant and machinery, levels of inventory – all having a definite bearing on economic activities. Also future spending habits of consumers are taken into account.
- (b) **Barometer/Indicator Approach:** Various indicators are used to find out how the economy shall perform in the future. The indicators have been classified as under:
 - (1) *Leading Indicators:* They lead the economic activity in terms of their outcome. They relate to the time series data of the variables that reach high/low points in advance of economic activity.
 - (2) *Roughly Coincidental Indicators:* They reach their peaks and troughs at approximately the same in the economy.
 - (3) *Lagging Indicators:* They are time series data of variables that lag behind in their consequences vis-a- vis the economy. They reach their turning points after the economy has reached its own already.

All these approaches suggest direction of change in the aggregate economic activity but nothing about its magnitude.
- (c) **Economic Model Building Approach:** In this approach, a precise and clear relationship between dependent and independent variables is determined. GNP model building or sectoral analysis is used in practice through the use of national accounting framework.

Question 8

A company has a book value per share of ₹137.80. Its return on equity is 15% and it follows a policy of retaining 60% of its earnings. If the Opportunity Cost of Capital is 18%, what is the price of the share today?

Answer

The company earnings and dividend per share after a year are expected to be:

$$\text{EPS} = ₹ 137.8 \times 0.15 = ₹ 20.67$$

$$\text{Dividend} = 0.40 \times 20.67 = ₹ 8.27$$

The growth in dividend would be:

$$g = 0.6 \times 0.15 = 0.09$$

6.18 Strategic Financial Management

Perpetual growth model Formula : $P_0 = \frac{\text{Dividend}}{K_e - g}$

$$P_0 = \frac{8.27}{0.18 - 0.09}$$

$$P_0 = ₹ 91.89$$

Alternative Solution:

However, in case a student follows Walter's approach as against continuous growth model given in previous solution the answer of the question works out to be different. This can be shown as follow:

Given data:

Book value per share = ₹ 137.80

Return on equity = 15%

Dividend Payout = 40%

Cost of capital = 18%

\ EPS = ₹ 137.80 × 15%
= ₹ 20.67

\ Dividend = ₹ 20.67 × 40%
= ₹ 8.27

Walter's approach showing relationship between dividend and share price can be expressed by the following formula

$$V_c = \frac{D + \frac{R_a}{R_c}(E - D)}{R_c}$$

Where,

V_c = Market Price of the ordinary share of the company.

R_a = Return on internal retention i.e. the rate company earns on retained profits.

R_c = Capitalisation rate i.e. the rate expected by investors by way of return from particular category of shares.

E = Earnings per share.

D = Dividend per share.

Hence,

$$V_c = \frac{8.27 + \frac{.15}{.18}(20.67 - 8.27)}{.18}$$

$$= \frac{18.60}{.18}$$

$$= ₹ 103.35$$

Question 9

ABC Limited's shares are currently selling at ₹ 13 per share. There are 10,00,000 shares outstanding. The firm is planning to raise ₹ 20 lakhs to Finance a new project.

Required:

What are the ex-right price of shares and the value of a right, if

- (i) The firm offers one right share for every two shares held.
- (ii) The firm offers one right share for every four shares held.
- (iii) How does the shareholders' wealth change from (i) to (ii)? How does right issue increases shareholders' wealth?

Answer

- (i) Number of shares to be issued : 5,00,000

Subscription price ₹ 20,00,000 / 5,00,000 = ₹ 4

$$\text{Ex-right Price} = \frac{₹ 1,30,00,000 + ₹ 20,00,000}{15,00,000} = ₹ 10$$

$$\text{Value of right} = \frac{₹ 10 - ₹ 4}{2} = 3$$

- (ii) Subscription price ₹ 20,00,000 / 2,50,000 = ₹ 8

$$\text{Ex-right Price} = \frac{₹ 1,30,00,000 + ₹ 20,00,000}{12,50,000} = ₹ 12$$

$$\text{Value of right} = \frac{₹ 12 - ₹ 8}{4} = ₹ 1.$$

- (iii) Calculation of effect of right issue on wealth of Shareholder's wealth who is holding, say 100 shares.

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- (a) When firm offers one share for two shares held.

Value of Shares after right issue	(150 X ₹ 10)	₹ 1,500
Less: Amount paid to acquire right shares	(50X₹4)	<u>₹ 200</u>
		<u>₹1,300</u>

- (b) When firm offers one share for every four shares held.

Value of Shares after right issue	(125 X ₹ 12)	₹ 1,500
Less: Amount paid to acquire right shares	(50X₹8)	<u>₹ 200</u>
		<u>₹1,300</u>

- (c) Wealth of Shareholders before Right Issue ₹ 1,300

Thus, there will be no change in the wealth of shareholders from (i) and (ii).

Question 10

Pragya Limited has issued 75,000 equity shares of ₹ 10 each. The current market price per share is ₹ 24. The company has a plan to make a rights issue of one new equity share at a price of ₹ 16 for every four share held.

You are required to:

- Calculate the theoretical post-rights price per share;
- Calculate the theoretical value of the right alone;
- Show the effect of the rights issue on the wealth of a shareholder, who has 1,000 shares assuming he sells the entire rights; and
- Show the effect, if the same shareholder does not take any action and ignores the issue.

Answer

- (i) Calculation of theoretical Post-rights (ex-right) price per share:

$$\text{Ex-right value} = \frac{M + \frac{S}{N+R}}{1}$$

Where,

M = Market price,

N = Number of old shares for a right share

S = Subscription price

R = Right share offer

$$= \frac{₹ 24 + \frac{₹ 16}{4 + 1}}{1} = ₹ 22.40$$

(ii) Calculation of theoretical value of the rights alone:

= Ex-right price – Cost of rights share

= ₹ 22.40 – ₹ 16 = ₹ 6.40

(iii) Calculation of effect of the rights issue on the wealth of a shareholder who has 1,000 shares assuming he sells the entire rights:

		₹
(a)	Value of shares before right issue (1,000 shares × ₹ 24)	24,000
(b)	Value of shares after right issue (1,000 shares × ₹ 22.40)	22,400
	Add: Sale proceeds of rights renunciation (250 shares × ₹ 6.40)	<u>1,600</u>
		<u>24,000</u>

There is no change in the wealth of the shareholder if he does not take any action and ignores the issue.

(iv) Calculation of effect if the shareholder does not take any action and ignores the issue:

	₹
Value of shares before right issue (1,000 shares × ₹ 24)	24,000
Less: Value of shares after right issue (1,000 shares × ₹ 22.40)	<u>22,400</u>
Loss of wealth to shareholders, if rights ignored	<u>1,600</u>

Question 11

On the basis of the following information:

Current dividend (D_0) = ₹2.50

Discount rate (k) = 10.5%

Growth rate (g) = 2%

(i) Calculate the present value of stock of ABC Ltd.

6.22 Strategic Financial Management

- (ii) Is its stock overvalued if stock price is ₹35, ROE = 9% and EPS = ₹2.25? Show detailed calculation.

Answer

- (i) **Present Value of the stock of ABC Ltd. Is:-**

$$V_0 = \frac{2.50(1.02)}{0.105 - 0.02} = ₹30/-$$

- (ii) **Pay out ratio of ABC Ltd.**

$$= \frac{2.5}{2.25} = 1.111$$

$$\begin{aligned}\text{Hence, Retention ratio} &= 1 - 1.111 \\ &= -0.111\end{aligned}$$

Or -11.1%

$$\begin{aligned}\text{Sustainable growth ratio is} &= -0.111 \times 0.09 \\ &= -0.00999 \\ &= -0.999\%\end{aligned}$$

Using the constant growth model, the value is

$$= \frac{\text{Rs.}2.50(0.99)}{0.105 - (-0.00999)} = \frac{2.475}{0.11499} = ₹21.52$$

This value is less than the stock price of ₹30/- as calculated above or ₹35, as given in the question, which indicates that stock of ABC Ltd. is Overvalued.

Alternative answer (ii)

$$(\text{MV}) \text{ of Stock in } ₹ = \frac{D_1}{k_e - g} = \frac{D_0(1+g)}{(k_e - g)}$$

$$= \frac{2.5 \times 1.02}{0.105 - 0.02} = 30$$

$$(\text{BV}) = \frac{₹ 2.25}{0.09} = ₹ 25$$

$$\text{Again } \frac{(\text{MV})}{(\text{BV})} = \frac{k_r - g}{k_e - g} \text{ where symbols denote their usual notations.}$$

$$\text{So, } \frac{0.09 - 0.02}{0.105 - 0.02} = \frac{(MV)}{25} \text{ or, } \frac{0.07}{0.085} = \frac{(MV)}{25}$$

$$\therefore (MV) = \frac{₹ 0.07}{0.085} \times 25 = ₹ 20.59$$

Based on $\frac{(MV)}{(BV)}$ ratio and based on perpetual growth model the price of the share should be ₹20.59 and ₹30 respectively which are lower than the present (MV) of ₹35.

The stock is therefore, Overvalued.

Question 12

ABC Ltd. has been maintaining a growth rate of 10 percent in dividends. The company has paid dividend @ ₹3 per share. The rate of return on market portfolio is 12 percent and the risk free rate of return in the market has been observed as 8 percent. The Beta co-efficient of company's share is 1.5.

You are required to calculate the expected rate of return on company's shares as per CAPM model and equilibrium price per share by dividend growth model.

Answer

CAPM formula for calculation of Expected Rate of Return is :

$$\begin{aligned} \text{ER} &= R_f + \beta (R_m - R_f) \\ &= 8 + 1.5 (12 - 8) \\ &= 8 + 1.5 (4) \\ &= 8 + 6 \\ &= 14\% \text{ or } 0.14 \end{aligned}$$

Applying Dividend Growth Model for the calculation of per share equilibrium price:

$$\begin{aligned} \text{ER} &= \frac{D_1}{P_0} + g \\ 0.14 &= \frac{3(1.10)}{P_0} + 0.10 \\ 0.14 - 0.10 &= \frac{3.30}{P_0} \\ 0.04 P_0 &= 3.30 \end{aligned}$$

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$$P_0 = \frac{3.30}{0.04} = ₹ 82.50$$

Per share equilibrium price will be ₹ 82.50.

Question 13

Calculate the value of share from the following information:

Profit of the company	₹ 290 crores
Equity capital of company	₹ 1,300 crores
Par value of share	₹ 40 each
Debt ratio of company	27
Long run growth rate of the company	8%
Beta 0.1; risk free interest rate	8.7%
Market returns	10.3%
Capital expenditure per share	₹ 47
Depreciation per share	₹ 39
Change in Working capital	₹ 3.45 per share

Answer

$$\text{No. of Shares} = \frac{₹ 1,300 \text{ crores}}{₹ 40 \text{ crores}} = 32.5 \text{ Crores}$$

$$\text{EPS} = \frac{\text{PAT}}{\text{No. of shares}}$$

$$\text{EPS} = \frac{₹ 290 \text{ crores}}{32.5 \text{ crores}} = ₹ 8.923$$

$$\text{FCFE} = \text{Net income} - [(1-b) (\text{capex} - \text{dep}) + (1-b) (\Delta \text{WC})]$$

$$\begin{aligned} \text{FCFE} &= 8.923 - [(1-0.27) (47-39) + (1-0.27) (3.45)] \\ &= 8.923 - [5.84 + 2.5185] \\ &= 0.5645 \end{aligned}$$

$$\begin{aligned} \text{Cost of Equity} &= R_f + \beta (R_m - R_f) \\ &= 8.7 + 0.1 (10.3 - 8.7) \\ &= 8.86\% \end{aligned}$$

$$P_0 = \frac{FCFE(1+g)}{K_e - g} = \frac{0.5645(1.08)}{0.0886 - .08} = \frac{0.60966}{0.0086} = ₹ 70.89$$

Question 14

XYZ company has current earnings of ₹ 3 per share with 5,00,000 shares outstanding. The company plans to issue 40,000, 7% convertible preference shares of ₹ 50 each at par. The preference shares are convertible into 2 shares for each preference shares held. The equity share has a current market price of ₹ 21 per share.

- (i) What is preference share's conversion value?
- (ii) What is conversion premium?
- (iii) Assuming that total earnings remain the same, calculate the effect of the issue on the basic earning per share (a) before conversion (b) after conversion.
- (iv) If profits after tax increases by ₹ 1 million what will be the basic EPS (a) before conversion and (b) on a fully diluted basis?

Answer**(i) Conversion value of preference share**

$$2 \times ₹ 21 = ₹ 42$$

Conversion Ratio x Market Price

(ii) Conversion Premium

$$(₹ 50 / ₹ 42) - 1 = 19.05\%$$

(iii) Effect of the issue on basic EPS

BEFORE CONVERSION	₹
Total (after tax) earnings $3 \times ₹ 5,00,000$	15,00,000
Dividend or Preference shares	<u>1,40,000</u>
Earnings available to equity holders	<u>13,60,000</u>
No. of shares	5,00,000
EPS	2.72
ON DILUTED BASIS	
Earnings	15,00,000
No of shares $(₹ 5,00,000 + ₹ 80,000)$	5,80,000
EPS	2.59

(iv) EPS with increase in Profit

	₹
Earnings	25,00,000
Dividend on Pref. shares	<u>1,40,000</u>
Earning for equity shareholders	<u>23,60,000</u>
No. of equity shares	5,00,000
EPS	4.72
<u>On DILUTED BASIS</u>	
Earnings	25,00,000
No. of shares	5,80,000
EPS	4.31

Question 15

Shares of Voyage Ltd. are being quoted at a price-earning ratio of 8 times. The company retains 45% of its earnings which are ₹ 5 per share.

You are required to compute

- (1) The cost of equity to the company if the market expects a growth rate of 15% p.a.
- (2) If the anticipated growth rate is 16% per annum, calculate the indicative market price with the same cost of capital.
- (3) If the company's cost of capital is 20% p.a. & the anticipated growth rate is 19% p.a., calculate the market price per share.

Answer**(1) Cost of Capital**

Retained earnings (45%)	₹ 5 per share
Dividend (55%)	₹ 6.11 per share
EPS (100%)	₹ 11.11 per share
P/E Ratio	8 times
Market price	₹ 11.11 × 8 = ₹ 88.88
Cost of equity capital	

$$= \frac{\text{Div}}{\text{Price}} \times 100 \div \frac{\text{EPS}}{\text{Price}} + \text{Growth \%} = \frac{₹ 6.11}{₹ 88.88} \times 100 + 15\% = 21.87\%$$

$$(2) \text{ Market Price} = \frac{\text{Dividend}}{\text{Cost of Capital}(\%) - \text{Growth Rate}(\%)}$$

$$= \frac{₹ 6.11}{(21.87 - 16)\%} = ₹ 104.08 \text{ per share}$$

$$(3) \text{ Market Price} = \frac{₹ 6.11}{(20 - 19)\%} = ₹ 611.00 \text{ per share}$$

Alternative Solution-As in the question the sentence "The company retains 45% of its earnings which are ₹ 5 per share" amenable to two interpretations i.e. one is ₹ 5 as retained earnings (45%) and another is ₹ 5 is EPS (100%). Alternative solution is as follows:

(1) Cost of capital

EPS (100%)	₹ 5 per share
Retained earnings (45%)	₹ 2.25 per share
Dividend (55%)	₹ 2.75 per share
P/E Ratio	8 times
Market Price	₹ 5 × 8 = ₹ 40
Cost of equity capital	

$$= \frac{\text{Div}}{\text{Price}} \times 100 + \text{Growth \%} = \frac{₹ 2.75}{₹ 40.00} \times 100 + 15\% = 21.87\%$$

$$(2) \text{ Market Price} = \frac{\text{Dividend}}{\text{Cost of Capital(\%) - Growth Rate(\%)}} \times \frac{100}{100} = \frac{₹ 2.75}{(21.87 - 16)\%} \times \frac{100}{100} = ₹ 46.85 \text{ per share}$$

$$(3) \text{ Market Price} = \frac{₹ 2.75}{(20 - 19)\%} = ₹ 275.00 \text{ per share}$$

Question 16

Following Financial data are available for PQR Ltd. for the year 2008 :

	(₹ in lakh)
8% debentures	125
10% bonds (2007)	50
Equity shares (₹10 each)	100
Reserves and Surplus	300
Total Assets	600
Assets Turnovers ratio	1.1
Effective interest rate	8%
Effective tax rate	40%

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Operating margin	10%
Dividend payout ratio	16.67%
Current market Price of Share	14
Required rate of return of investors	15%

You are required to:

- Draw income statement for the year
- Calculate its sustainable growth rate
- Calculate the fair price of the Company's share using dividend discount model, and
- What is your opinion on investment in the company's share at current price?

Answer

(i) Workings:

Asset turnover ratio	= 1.1
Total Assets	= ₹ 600
Turnover ₹ 600 lakhs × 11	= ₹ 660 lakhs
Effective market rate	= $\frac{\text{Interest}}{\text{Liabilities}} = 8\%$
Liabilities	= ₹ 125 lakhs + 50 lakhs = 175 lakh
Interest	= ₹ 175 lakhs × 0.08 = ₹ 14 lakh
Operating Margin	= 10%
Hence operating cost	= (1 - 0.10) ₹ 660 lakhs = ₹ 594 lakh
Dividend Payout	= 16.67%
Tax rate	= 40%

(i) Income statement

	(₹ Lakhs)
Sale	660
Operating Exp	<u>594</u>
EBIT	66
Interest	<u>14</u>
EBT	52
Tax @ 40%	<u>20.80</u>
EAT	31.20

Dividend @ 16.67%	<u>5.20</u>
Retained Earnings	<u>26.00</u>

(ii) $SGR = G = ROE (1-b)$

$$ROE = \frac{PAT}{NW} \text{ and } NW = ₹ 100 \text{ lakh} + ₹ 300 \text{ lakh} = 400 \text{ lakh}$$

$$ROE = \frac{₹ 31.2 \text{ lakhs}}{₹ 400 \text{ lakhs}} \times 100 = 7.8\%$$

$$SGR = 0.078(1 - 0.1667) = 6.5\%$$

(iii) Calculation of fair price of share using dividend discount model

$$P_0 = \frac{D_0(1+g)}{k_e - g}$$

$$\text{Dividends} = \frac{₹ 5.2 \text{ lakhs}}{₹ 10 \text{ lakhs}} = ₹ 0.52$$

$$\text{Growth Rate} = 6.5\%$$

$$\text{Hence } P_0 = \frac{₹ 0.52(1+0.065)}{0.15-0.065} = \frac{₹ 0.5538}{0.085} = ₹ 6.51$$

(iv) Since the current market price of share is ₹ 14, the share is overvalued. Hence the investor should not invest in the company.

Question 17

M/s X Ltd. has paid a dividend of ₹ 2.5 per share on a face value of ₹ 10 in the financial year ending on 31st March, 2009. The details are as follows:

Current market price of share	₹ 60
Growth rate of earnings and dividends	10%
Beta of share	0.75
Average market return	15%
Risk free rate of return	9%

Calculate the intrinsic value of the share.

Answer

$$\text{Intrinsic Value } P_0 = \frac{D_1}{k - g}$$

6.30 Strategic Financial Management

Using CAPM

$$k = R_f + b (R_m - R_f)$$

R_f = Risk Free Rate

b = Beta of Security

R_m = Market Return

$$= 9\% + 0.75 (15\% - 9\%) = 13.5\%$$

$$P = \frac{2.5 \times 1.1}{0.135 - 0.10} = \frac{2.75}{0.035} = ₹ 78.57$$

Question 18

Mr. A is thinking of buying shares at ₹ 500 each having face value of Re. 100. He is expecting a bonus at the ratio of 1:5 during the fourth year. Annual expected dividend is 20% and the same rate is expected to be maintained on the expanded capital base. He intends to sell the shares at the end of seventh year at an expected price of ₹ 900 each. Incidental expenses for purchase and sale of shares are estimated to be 5% of the market price. He expects a minimum return of 12% per annum.

Should Mr. A buy the share? If so, what maximum price should he pay for each share? Assume no tax on dividend income and capital gain.

Answer

P.V. of dividend stream and sales proceeds

Year	Divd. /Sale	PVF (12%)	PV (₹)
1	₹ 20/-	0.893	17.86
2	₹ 20/-	0.797	15.94
3	₹ 20/-	0.712	14.24
4	₹ 24/-	0.636	15.26
5	₹ 24/-	0.567	13.61
6	₹ 24/-	0.507	12.17
7	₹ 24/-	0.452	10.85
7	₹ 1026/- (₹ 900 x 1.2 x 0.95)	0.452	<u>463.75</u>
			₹ 563.68
	Less : - Cost of Share (₹ 500 x 1.05)		<u>₹ 525.00</u>
	Net gain		<u>₹ 38.68</u>

Since Mr. A is gaining ₹ 38.68 per share, he should buy the share.

Maximum price Mr. A should be ready to pay is ₹ 563.68 which will include incidental expenses. So the maximum price should be ₹ 563.68 x 100/105 = ₹ 536.84

Question 19

A convertible bond with a face value of ₹ 1,000 is issued at ₹ 1,350 with a coupon rate of 10.5%. The conversion rate is 14 shares per bond. The current market price of bond and share is ₹ 1,475 and ₹ 80 respectively. What is the premium over conversion value?

Answer

Conversion rate is 14 shares per bond. Market price of share ₹ 80

Conversion Value 14 x ₹ 80 = ₹ 1120

Market price of bond = ₹ 1475

Premium over Conversion Value (₹ 1475- ₹ 1120) = $\frac{355}{1120} \times 100 = 31.7\%$

Question 20

Saranam Ltd. has issued convertible debentures with coupon rate 12%. Each debenture has an option to convert to 20 equity shares at any time until the date of maturity. Debentures will be redeemed at ₹ 100 on maturity of 5 years. An investor generally requires a rate of return of 8% p.a. on a 5-year security. As an investor when will you exercise conversion for given market prices of the equity share of (i) ₹ 4, (ii) ₹ 5 and (iii) ₹ 6.

Cumulative PV factor for 8% for 5 years : 3.993

PV factor for 8% for year 5 : 0.681

Answer

If Debentures are not converted its value is as under: -

	PVF @ 8 %	₹
Interest - ₹ 12 for 5 years	3.993	47.916
Redemption - ₹ 100 in 5 th year	0.681	<u>68.100</u>
		<u>116.016</u>

Value of equity shares:-

Market Price	No.	Total
₹ 4	20	₹ 80
₹ 5	20	₹ 100
₹ 6	20	₹ 120

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Hence, unless the market price is ₹ 6 conversion should not be exercised.

Question 21

XYZ company has current earnings of ₹ 3 per share with 5,00,000 shares outstanding. The company plans to issue 40,000, 7% convertible preference shares of ₹. 50 each at par. The preference shares are convertible into 2 shares for each preference shares held. The equity share has a current market price of ₹ 21 per share.

- (i) What is preference share's conversion value?
- (ii) What is conversion premium?
- (iii) Assuming that total earnings remain the same, calculate the effect of the issue on the basic earning per share (a) before conversion (b) after conversion.
- (iv) If profits after tax increases by ₹ 1 million what will be the basic EPS (a) before conversion and (b) on a fully diluted basis?

Answer

- (i) Conversion value of preference share

$$2 \times ₹ 21 = ₹ 42$$

Conversion Ratio x Market Price

- (ii) Conversion Premium

$$(₹ 50 / ₹ 42) - 1 = 19.05\%$$

- (iii) Effect of the issue on basic EPS

BEFORE CONVERSION	₹
Total (after tax) earnings $3 \times ₹ 5,00,000$	15,00,000
Dividend or Preference shares	<u>1,40,000</u>
Earnings available to equity holders	<u>13,60,000</u>
No. of shares	5,00,000
EPS	2.72
ON DILUTED BASIS	
Earnings	15,00,000
No of shares $(₹ 5,00,000 + ₹ 80,000)$	5,80,000
EPS	2.59

- (iv) EPS with increase in Profit

	₹
Earnings	25,00,000
Dividend on Pref. shares	<u>1,40,000</u>
Earning for equity shareholders	<u>23,60,000</u>
No. of equity shares	5,00,000
EPS	4.72
<u>On DILUTED BASIS</u>	
Earnings	25,00,000
No. of shows	5,80,000
EPS	4.31

Question 22

The data given below relates to a convertible bond :

Face value	₹ 250
Coupon rate	12%
No. of shares per bond	20
Market price of share	₹ 12
Straight value of bond	₹ 235
Market price of convertible bond	₹ 265

Calculate :

- (i) Stock value of bond.
- (ii) The percentage of downside risk.
- (iii) The conversion premium
- (iv) The conversion parity price of the stock.

Answer

- (i) **Stock value or conversion value of bond**

$$12 \times 20 = ₹ 240$$

- (ii) **Percentage of the downside risk**

$$\frac{₹ 265 - ₹ 235}{₹ 235} = 0.1277 \text{ or } 12.77\%$$

This ratio gives the percentage price decline experienced by the bond if the stock becomes worthless.

(iii) Conversion Premium

$$\frac{\text{Market Price} - \text{Conversion Value}}{\text{Conversion Value}} \times 100$$

$$\frac{\text{₹ } 265 - \text{₹ } 240}{\text{₹ } 240} \times 100 = 10.42\%$$

Conversion Parity Price

$$\frac{\text{Bond Price}}{\text{No. of Shares on Conversion}}$$

$$\frac{\text{₹ } 265}{20} = \text{₹ } 13.25$$

This indicates that if the price of shares rises to ₹ 13.25 from ₹ 12 the investor will neither gain nor lose on buying the bond and exercising it. Observe that ₹ 1.25 (₹ 13.25 – ₹ 12.00) is 10.42% of ₹ 12, the Conversion Premium.

Question 23

Rahul Ltd. has surplus cash of ₹ 100 lakhs and wants to distribute 27% of it to the shareholders. The company decides to buy back shares. The Finance Manager of the company estimates that its share price after re-purchase is likely to be 10% above the buyback price-if the buyback route is taken. The number of shares outstanding at present is 10 lakhs and the current EPS is ₹ 3.

You are required to determine:

- (i) The price at which the shares can be re-purchased, if the market capitalization of the company should be ₹ 210 lakhs after buyback,
- (ii) The number of shares that can be re-purchased, and
- (iii) The impact of share re-purchase on the EPS, assuming that net income is the same.

Answer

- (i) Let P be the buyback price decided by Rahul Ltd.

Market Capitalisation after Buyback

1.1P (Original Shares – Shares Bought Back)

$$= 1.1P \times 10 \text{ lakhs} - \frac{27\% \text{ of } 100 \text{ lakhs}}{P}$$

$$= 11 \text{ lakhs} \times P - 27 \text{ lakhs} \times 1.1 = 11 \text{ lakhs} P - 29.7 \text{ lakhs}$$

Again, 11 lakhs P – 29.7 lakhs

or 11 lakhs P = 210 lakhs + 29.7 lakhs

$$\text{or } P = \frac{239.7}{11} = ₹ 21.79 \text{ per share}$$

(ii) **Number of Shares to be Bought Back :-**

$$\frac{₹ 27 \text{ lakhs}}{₹ 21.79} = 1.24 \text{ lakhs (Approx.) or } 123910 \text{ share}$$

(iii) **New Equity Shares :-**

10 lakhs – 1.24 lakhs = 8.76 lakhs or 1000000 – 123910 = 876090 shares

$$\backslash \text{ EPS} = \frac{₹ 10 \text{ lakhs}}{8.76 \text{ lakhs}} = ₹ 3.43$$

Thus, EPS of Rahul Ltd., increases to ₹ 3.43.

Question 24

Z Co. Ltd. issued commercial paper worth ₹10 crores as per following details:

Date of issue :	16 th January, 2009
Date of maturity:	17 th April, 2009
No. of days :	91
Interest rate	12.04% p.a

What was the net amount received by the company on issue of CP? (Charges of intermediary may be ignored)

Answer

The company had issued commercial paper worth ₹10 crores

No. of days Involves = 91 days

Interest rate applicable = 12.04 % p.a.

$$\text{Interest for 91 days} = 12.04\% \times \frac{91 \text{ days}}{365 \text{ days}} = 3.001\%$$

$$= \text{or } ₹ 10 \text{ crores} \times \frac{3.001}{100 + 3.001} = ₹ 29,13,563$$

or ₹ 29.1356 Lakhs

\ Net amount received at the time of issue:-

₹10.00 Crores – 0.2913 Crore = ₹ 9.7087 Crore

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Question 25

From the following particulars, calculate the effective rate of interest p.a. as well as the total cost of funds to Bhaskar Ltd., which is planning a CP issue:

Issue Price of CP	₹ 97,550
Face Value	₹ 1,00,000
Maturity Period	3 Months
Issue Expenses:	
Brokerage	0.15% for 3 months
Rating Charges	0.50% p.a.
Stamp Duty	0.175% for 3 months

Answer

$$\text{Effective Interest} = \frac{F - P}{P} \times \frac{12}{M} \times 100$$

Where

F= Face Value

P= Issue Price

$$= \frac{1,00,000 - 97,550}{97,550} \times \frac{12}{3} \times 100 = 0.025115 \times 4 \times 100 = 10.046 = 10.05\% \text{ p.a.}$$

\ Effective interest rate = 10.05% p.a.

Cost of Funds to the Company

Effective Interest	10.05%
Brokerage (0.150 × 4)	0.60%
Rating Charge	0.50%
Stamp duty (0.175 × 4)	<u>0.70%</u>
	<u>11.85%</u>

Question 26

Tender Ltd has earned a net profit of ₹ 15 lacs after tax at 30%. Interest cost charged by financial institutions was ₹ 10 lacs. The invested capital is ₹ 95 lacs of which 55% is debt. The company maintains a weighted average cost of capital of 13%. Required,

- Compute the operating income.
- Compute the Economic Value Added (EVA).

(c) Tender Ltd. has 6 lac equity shares outstanding. How much dividend can the company pay before the value of the entity starts declining?

Answer

$$\text{Taxable Income} = ₹ 15 \text{ lac} / (1 - 0.30)$$

$$= ₹ 21.43 \text{ lacs} \quad \text{or} \quad ₹ 21,42,857$$

$$\text{Operating Income} = \text{Taxable Income} + \text{Interest}$$

$$= ₹ 21,42,857 + ₹ 10,00,000$$

$$= ₹ 31,42,857 \quad \text{or} \quad ₹ 31.43 \text{ lacs}$$

$$\begin{aligned} \text{EVA} &= \text{EBIT} (1 - \text{Tax Rate}) - \text{WACC} \times \text{Invested Capital} \\ &= ₹ 31,42,857 (1 - 0.30) - 13\% \times ₹ 95,00,000 \\ &= ₹ 22,00,000 - ₹ 12,35,000 = ₹ 9,65,000 \end{aligned}$$

$$\text{EVA Dividend} = \frac{₹ 9,65,000}{6,00,000} = ₹ 1.6083$$

Question 27

The following information is given for 3 companies that are identical except for their capital structure:

	Orange	Grape	Apple
Total invested capital	1,00,000	1,00,000	1,00,000
Debt/assets ratio	0.8	0.5	0.2
Shares outstanding	6,100	8,300	10,000
Pre tax cost of debt	16%	13%	15%
Cost of equity	26%	22%	20%
Operating Income (EBIT)	25,000	25,000	25,000
Net Income	8,970	12,350	14,950

The tax rate is uniform 35% in all cases.

- Compute the Weighted average cost of capital for each company.
- Compute the Economic Value Added (EVA) for each company.
- Based on the EVA, which company would be considered for best investment? Give reasons.
- If the industry PE ratio is 11x, estimate the price for the share of each company.

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(v) Calculate the estimated market capitalisation for each of the Companies.

Answer

(i) Working for calculation of WACC

	Orange	Grape	Apple
Total debt	80,000	50,000	20,000
Post tax Cost of debt	10.4%	8.45%	9.75%
Equity Fund	20,000	50,000	80,000

WACC

Orange: $(10.4 \times 0.8) + (26 \times 0.2) = 13.52\%$

Grape: $(8.45 \times 0.5) + (22 \times 0.5) = 15.225\%$

Apple: $(9.75 \times 0.2) + (20 \times 0.8) = 17.95\%$

(ii)

	Orange	Grape	Apple
WACC	13.52	15.225	17.95
EVA [EBIT (1-T)-(WACC x Invested Capital)]	2,730	1,025	-1,700

(iii) Orange would be considered as the best investment since the EVA of the company is highest and its weighted average cost of capital is the lowest

(iv) Estimated Price of each company shares

	Orange	Grape	Apple
EBIT (₹)	25,000	25,000	25,000
Interest (₹)	12,800	6,500	3,000
Taxable Income (₹)	12,200	18,500	22,000
Tax 35% (₹)	4,270	6,475	7,700
Net Income (₹)	7,930	12,025	14,300
Shares	6,100	8,300	10,000
EPS (₹)	1.3	1.448795	1.43
Stock Price (EPS x PE Ratio) (₹)	14.30	15.94	15.73

Since the three entities have different capital structures they would be exposed to different degrees of financial risk. The PE ratio should therefore be adjusted for the risk factor.

Alternative Answer

	Orange	Grape	Apple
Net Income (Given) (₹)	8,970	12,350	14,950
Shares	6,100	8,300	10,000
EPS (₹)	1.4705	1.488	1.495
Stock Price (EPS x PE Ratio) (₹)	16.18	16.368	16.45

(v) Market Capitalisation

Estimated Stock Price (₹)	14.30	15.94	15.73
No. of shares	6,100	8,300	10,000
Estimated Market Cap (₹)	87,230	1,32,302	1,57,300

Question 28

If the market price of the bond is ₹ 95; years to maturity = 6 yrs: coupon rate = 13% p.a (paid annually) and issue price is ₹ 100. What is the yield to maturity?

Answer

$$YTM = \frac{C + \frac{(F - P)}{n}}{\frac{F + P}{2}} \quad C = \text{Coupon Rate}; F = \text{Face Value (Issue Price)}; P = \text{Market Price of Bond}$$

$$YTM = \frac{13 + \frac{(100 - 95)}{6}}{\frac{100 + 95}{2}} = 0.1418 \text{ or } 14.18\%$$

Question 29

An investor is considering the purchase of the following Bond:

Face value	₹ 100
Coupon rate	11%
Maturity	3 years

- (i) If he wants a yield of 13% what is the maximum price he should be ready to pay for?
- (ii) If the Bond is selling for ₹ 97.60, what would be his yield?

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Answer

(i) Calculation of Maximum price

$$\begin{aligned}B_0 &= ₹ 11 \times PVIFA (13\%, 3) + ₹ 100 \times PVIF (13\%, 3) \\&= ₹ 11 \times 2.361 + ₹ 100 \times 0.693 \\&= ₹ 25.97 + ₹ 69.30 = ₹ 95.27\end{aligned}$$

(ii) Calculation of yield

$$\begin{aligned}\text{At 12\% the value} &= ₹ 11 \times PVIFA (12\%, 3) + 100 \times PVIF (12\%, 3) \\&= ₹ 11 \times 2.402 + ₹ 100 \times 0.712 = ₹ 26.42 + ₹ 71.20 = ₹ 97.62\end{aligned}$$

It the bond is selling at ₹ 97.60 which is more than the fair value, the YTM of the bond would be less than 13%. This value is almost equal to the amount price of ₹ 97.60. Therefore, the YTM of the bond would be 12%.

Alternatively

$$YTM = \frac{₹ 11 + \frac{(₹ 100 - ₹ 97.60)}{3}}{\frac{(₹ 100 + ₹ 97.60)}{2}} = 0.1194 \text{ or } 11.94\% \text{ say } 12\%$$

Question 30

Calculate Market Price of:

- (i) 10% Government of India security currently quoted at ₹ 110, but interest rate is expected to go up by 1%.
- (ii) A bond with 7.5% coupon interest, Face Value ₹ 10,000 & term to maturity of 2 years, presently yielding 6% . Interest payable half yearly.

Answer

- (i) Current yield = (Coupon Interest / Market Price) X 100
 $(10/110) \times 100 = 9.09\%$
If current yield go up by 1% i.e. 10.09 the market price would be
 $10.09 = 10 / \text{Market Price} \times 100$
Market Price = ₹ 99.11
- (ii) Market Price of Bond = P.V. of Interest + P.V. of Principal
 $= ₹ 1,394 + ₹ 8,885 = ₹ 10,279$

Question 31

Find the current market price of a bond having face value ₹1,00,000 redeemable after 6 year maturity with YTM at 16% payable annually and duration 4.3202 years. Given $1.16^6 = 2.4364$.

Answer

The formula for the duration of a coupon bond is as follows:

$$= \frac{1 + \text{YTM}}{\text{YTM}} - \frac{(1 + \text{YTM}) + t(c - \text{YTM})}{c[(1 + \text{YTM})^t - 1] + \text{YTM}}$$

Where YTM = Yield to Maturity

c = Coupon Rate

t = Years to Maturity

Accordingly, since YTM = 0.16 and t = 6

$$4.3202 = \frac{1.16}{0.16} - \frac{1.16 + 6(c - 0.16)}{c[(1.16)^6 - 1] + 0.16}$$

$$4.3202 = 7.25 - \frac{1.16 + (6c - 0.96)}{1.4364c + 0.16}$$

$$\frac{1.16 + 6c - 0.96}{1.4364c + 0.16} = 2.9298$$

$$0.2 + 6c = 4.20836472c + 0.468768$$

$$1.79163528c = 0.268768$$

$$C = 0.150012674$$

$$\therefore c = 0.15$$

Where c = Coupon rate

Therefore, current price = ₹(1,00,000/- x 0.15 x 3.685 + 1,00,000/- x 0.410) = ₹96,275/-.

Question 32

There is a 9% 5-year bond issue in the market. The issue price is ₹ 90 and the redemption price ₹ 105. For an investor with marginal income tax rate of 30% and capital gains tax rate of 10% (assuming no indexation), what is the post-tax yield to maturity?

Answer

Calculation of yield to Maturity (YTM)

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$$YTM = \frac{\text{Coupon} + \text{Pro-rated discount}}{(\text{Redemption price} + \text{Purchase Price})/2}$$

After tax coupon = $9 \times (1 - .30) = 6.3\%$

After tax redemption price = $105 - (15 \times .10)$ or ₹ 103.5

After tax capital gain = $103.50 - 90 = ₹ 13.50$

$$YTM = \frac{6.3 + (13.5/5)}{(103.5 + 90)/2} \text{ or } \frac{9.00}{96.75} = 9.30\%$$

Question 33

A money market instrument with face value of ₹100 and discount yield of 6% will mature in 45 days. You are required to calculate:

- (i) Current price of the instrument.
- (ii) Bond equivalent yield
- (iii) Effective annual return.

Answer

- (i) Current price of the Bond = $100 \times [1 - \{45/360\} \times 0.06] = ₹99.25$

Alternatively, the current price of bond may also be calculated as follows:

$$\frac{D}{100 - D} \times \frac{360}{45} = 0.06$$

$$\frac{D}{100 - D} = 0.06 \times \frac{45}{360}$$

$$\frac{D}{100 - D} = 0.06 \times \frac{1}{8}$$

$$8D = 6 - 0.06D$$

$$8.06D = 6$$

$$D = \frac{6}{8.06} = 0.7444$$

Current price of the bond = Face value – D

$$= ₹100 - 0.7444 = ₹99.2556$$

- (ii) Bond equivalent yield = $\frac{100 - 99.25}{99.25} \times \frac{360}{45} = 6.045\% \text{ P.A.}$

$$(iii) \text{ Effective annual return} = \left[1 + (0.06045/8)\right]^8 - 1 = 6.207\% \text{ P.A..}$$

Note: If a year of 365 days is considered the Bond equivalent yield and Effective annual return works out to 6.296% P.A.

Question 34

MP Ltd. issued a new series of bonds on January 1, 2010. The bonds were sold at par (₹1,000), having a coupon rate 10% p.a. and mature on 31st December, 2025. Coupon payments are made semiannually on June 30th and December 31st each year. Assume that you purchased an outstanding MP Ltd. bond on 1st March, 2018 when the going interest rate was 12%.

Required:

- (i) What was the YTM of MP Ltd. bonds as on January 1, 2010?
- (ii) What amount you should pay to complete the transaction? Of that amount how much should be accrued interest and how much would represent bonds basic value.

Answer

- (i) Since the bonds were sold at par, the original YTM was 10%.

$$\text{YTM} = \frac{\text{Interest}}{\text{Principal}} = \frac{₹ 100}{₹ 1,000} = 10\%$$

- (ii) Price of the bond as on 1st July, 2018 $= ₹50 \times 9.712 + ₹ 1,000 \times 0.417$
 $= ₹ 485.60 + ₹ 417$
 $= ₹902.60$

$$\text{Total value of the bond on the next} = ₹902.60 + ₹50 \text{ interest date} = ₹952.60$$

$$\begin{aligned} \text{Value of bond at purchase date} &= ₹952.60 \times \frac{1}{(1+0.6)^{1/3}} \\ &= ₹952.60 \times ₹0.980764 \text{ (by using excel)} \\ &= ₹934.28 \end{aligned}$$

The amount to be paid to complete the transaction is ₹934.28. Out of this amount ₹49.04 represent accrued interest and ₹885.24 represent the bond basic value.

Question 35

Based on the credit rating of bonds, Mr. Z has decided to apply the following discount rates for valuing bonds:

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Credit Rating	Discount Rate
AAA	364 day T bill rate + 3% spread
AA	AAA + 2% spread
A	AAA + 3% spread

He is considering to invest in AA rated, ₹1,000 face value bond currently selling at ₹1,025.86. The bond has five years to maturity and the coupon rate on the bond is 15% p.a. payable annually. The next interest payment is due one year from today and the bond is redeemable at par. (Assume the 364 day T-bill rate to be 9%).

You are required to calculate the intrinsic value of the bond for Mr. Z. Should he invest in the bond? Also calculate the current yield and the Yield to Maturity (YTM) of the bond.

Answer

The appropriate discount rate for valuing the bond for Mr. Z is:

$$R = 9\% + 3\% + 2\% = 14\%$$

Time	CF	PVIF 14% PV (CF)	PV (CF)
1	150	0.877	131.55
2	150	0.769	115.35
3	150	0.675	101.25
4	150	0.592	88.80
5	1150	0.519	<u>596.85</u>
∑ PV (CF) i.e. $P_0 =$			<u>1033.80</u>

Since, the current market value is less than the intrinsic value; Mr. Z should buy the bond. Current yield = Annual Interest / Price = $150 / 1025.86 = 14.62\%$

The YTM of the bond is calculated as follows:

@15%

$$\begin{aligned} P &= 150 \times PVIFA_{15\%, 4} + 1150 \times PVIF_{15\%, 5} \\ &= 150 \times 2.855 + 1150 \times 0.497 = 428.25 + 571.55 = 999.80 \end{aligned}$$

@14%

As found in sub part (a) $P_0 = 1033.80$

By interpolation we get,

$$= 14\% + \frac{7.94}{7.94 - (-26.06)} \times (15\% - 14\%) = 14\% + \frac{7.94}{34}\%$$

YTM = 14.23%

Question 36

M/s Agfa Industries is planning to issue a debenture series on the following terms:

Face value	₹ 100
Term of maturity	10 years
Yearly coupon rate	
Years	
1 - 4	9%
5 - 8	10%
9 - 10	14%

The current market rate on similar debentures is 15 per cent per annum. The Company proposes to price the issue in such a manner that it can yield 16 per cent compounded rate of return to the investors. The Company also proposes to redeem the debentures at 5 per cent premium on maturity. Determine the issue price of the debentures.

Answer

The issue price of the debentures will be the sum of present value of interest payments during 10 years of its maturity and present value of redemption value of debenture.

Years	Cash out flow (₹)	PVIF @ 16%	PV
1	9	.862	7.758
2	9	.743	6.687
3	9	.641	5.769
4	9	.552	4.968
5	10	.476	4.76
6	10	.410	4.10
7	10	.354	3.54
8	10	.305	3.05
9	14	.263	3.682
10	14 + 105 = 119	.227	<u>3.178 + 23.835</u>
			71.327

Thus the debentures should be priced at ₹ 71.327

Question 37

ABC Ltd. has ₹ 300 million, 12 per cent bonds outstanding with six years remaining to maturity. Since interest rates are falling, ABC Ltd. is contemplating of refunding these bonds with a ₹ 300 million issue of 6 year bonds carrying a coupon rate of 10 per cent. Issue cost of the new bond will be ₹ 6 million and the call premium is 4 per cent. ₹ 9 million being the unamortized portion of issue cost of old bonds can be written off no sooner the old bonds are called off. Marginal tax rate of ABC Ltd. is 30 per cent. You are required to analyse the bond refunding decision.

Answer**1. Calculation of initial outlay:-**

	₹ (million)
a. Face value	300
Add:- Call premium	<u>12</u>
Cost of calling old bonds	<u>312</u>
b. Gross proceed of new issue	300
Less: Issue costs	<u>6</u>
Net proceeds of new issue	294
c. Tax savings on call premium and unamortized cost $0.30 (12 + 9)$	6.3
\ Initial outlay = ₹ 312 million – ₹ 294 million – ₹ 6.3 million	
= ₹ 11.7 million	

2. Calculation of net present value of refunding the bond:-

Saving in annual interest expenses	₹ (million)
$[300 \times (0.12 - 0.10)]$	6.00
Less:- Tax saving on interest and amortization	
$0.30 \times [6 + (9-6)/6]$	<u>1.95</u>
Annual net cash saving	<u>4.05</u>
PVIFA (7%, 6 years)	4.766
\ Present value of net annual cash saving	₹ 19.30 million
Less:- Initial outlay	<u>₹ 11.70 million</u>
Net present value of refunding the bond	<u>₹ 7.60 million</u>

Decision: The bonds should be refunded

Question 38

M/s Transindia Ltd. is contemplating calling ₹ 3 crores of 30 years, ₹ 1,000 bond issued 5 years ago with a coupon interest rate of 14 per cent. The bonds have a call price of ₹ 1,140

and had initially collected proceeds of ₹ 2.91 crores due to a discount of ₹ 30 per bond. The initial floating cost was ₹ 3,60,000. The Company intends to sell ₹ 3 crores of 12 per cent coupon rate, 25 years bonds to raise funds for retiring the old bonds. It proposes to sell the new bonds at their par value of ₹ 1,000. The estimated floatation cost is ₹ 4,00,000. The company is paying 40% tax and its after cost of debt is 8 per cent. As the new bonds must first be sold and their proceeds, then used to retire old bonds, the company expects a two months period of overlapping interest during which interest must be paid on both the old and new bonds. What is the feasibility of refunding bonds?

Answer

NPV for bond refunding

	₹
PV of annual cash flow savings (W.N. 2) (3,49,600 × PVIFA 8%,25) i.e. 10.675	37,31,980
Less: Initial investment (W.N. 1)	<u>29,20,000</u>
NPV	<u>8,11,980</u>

Recommendation: Refunding of bonds is recommended as NPV is positive.

Working Notes:

(1) Initial investment:

(a) Call premium

Before tax (1,140 – 1,000) × 30,000	42,00,000	
Less tax @ 40%	<u>16,80,000</u>	
After tax cost of call prem.		25,20,000

(b) Floatation cost 4,00,000

(c) Overlapping interest

Before tax (.14 × 2/12 × 3 crores)	7,00,000	
Less tax @ 40%	<u>2,80,000</u>	4,20,000

(d) Tax saving on unamortised discount on
old bond 25/30 × 9,00,000 × .4 (3,00,000)

(e) Tax savings from unamortised floatation

Cost of old bond 25/30 × 3,60,000 × .4	<u>(1,20,000)</u>	
		<u>29,20,000</u>

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(2) Annual cash flow savings:

(a) Old bond		
(i) Interest cost (.14 × 3 crores)	42,00,000	
Less tax @ 40%	<u>16,80,000</u>	25,20,000
(ii) Tax savings from amortisation of discount 9,00,000/30 × .4		(12,000)
(iii) Tax savings from amortisation of floatation cost 3,60,000/30 × .4		<u>(4,800)</u>
Annual after cost payment of Debt (A)		25,03,200
(b) New bond		
(i) Interest cost before tax (.12 × 3 crores)	36,00,000	
Less tax @ 40%	<u>14,40,000</u>	
After tax interest	21,60,000	
(ii) Tax savings from amortisation of floatation cost (.4 × 4,00,000/25)	<u>(6,400)</u>	21,53,600
Annual after tax payment		<u>3,49,600</u>

Question 39

The following data are available for a bond

Face value	₹ 1,000
Coupon Rate	16%
Years to Maturity	6
Redemption value	₹ 1,000
Yield to maturity	17%

What is the current market price, duration and volatility of this bond? Calculate the expected market price, if increase in required yield is by 75 basis points.

Answer

1. Calculation of Market price:

$$TM = \frac{\text{Coupon interest} + \frac{\text{Discount or premium}}{\text{Years left}}}{\frac{\text{Face Value} + \text{Market value}}{2}}$$

Discount or premium – YTM is more than coupon rate, market price is less than Face

Value i.e. at discount.

Let x be the market price

$$0.17 = \frac{160 + \frac{(1,000 - x)}{6}}{1,000 + x}$$

$$x = ₹ 960.26$$

Alternatively, the candidate may attempt by

$$160 (\text{PVIAF } 17\%, 6) + 1,000 (\text{PVIF } 17\%, 6)$$

$$= 160 (3.589) + 1,000 (0.390)$$

$$= 574.24 + 390$$

$$= 964.24$$

2. Duration

Year	Cash flow	P.V. @ 17%		Proportion of bond value	Proportion of bond value x time (years)
1	160	.855	136.80	0.142	0.142
2	160	.731	116.96	0.121	0.246
3	160	.624	99.84	0.103	0.309
4	160	.534	85.44	0.089	0.356
5	160	.456	72.96	0.076	0.380
6	1160	.390	<u>452.40</u>	<u>0.469</u>	<u>2.814</u>
			<u>964.40</u>	<u>1.000</u>	<u>4.247</u>

Duration of the Bond is 4.247 years

3. Volatility

$$\text{Volatility of the bonds} = \frac{\text{Duration}}{(1 + \text{yields})} = \frac{4.247}{1.17} = 3.63$$

4. The expected market price if increase in required yield is by 75 basis points.

$$= ₹ 960.26 \times .75 (3.63/100) = ₹ 26.142$$

$$\text{Hence expected market price is } ₹ 960.26 - ₹ 26.142 = ₹ 934.118$$

Hence, the market price will decrease

This portion can also be alternatively done as follows

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$$= ₹ 964.40 \times .75 (3.63/100)$$

$$= ₹ 26.26$$

then the market price will be

$$= ₹ 964.40 - 26.26 = ₹ 938.14$$

Question 40

XL Ispat Ltd. has made an issue of 14 per cent non-convertible debentures on January 1, 2007. These debentures have a face value of ₹100 and is currently traded in the market at a price of ₹90.

Interest on these NCDs will be paid through post-dated cheques dated June 30 and December 31. Interest payments for the first 3 years will be paid in advance through post-dated cheques while for the last 2 years post-dated cheques will be issued at the third year. The bond is redeemable at par on December 31, 2011 at the end of 5 years.

Required :

- (i) Estimate the current yield at the YTM of the bond.*
- (ii) Calculate the duration of the NCD.*
- (iii) Assuming that intermediate coupon payments are, not available for reinvestment calculate the realised yield on the NCD.*

Answer

(i) Current yield = $\frac{₹ 14}{₹ 90} = 0.1555$ or 15.55%

YTM can be determined from the following equation

$$14 \times PVIFA (YTM, 5) + 100 \times PVIF (YTM, 5) = 90$$

Let us discount the cash flows using two discount rates 15% and 18% as follows:

Year	Cash Flows	PVF@15%	PV@15%	PVF@18%	PV@18%
0	-90	1	-90	1	-90
1	14	0.870	12.18	0.847	11.86
2	14	0.756	10.58	0.718	10.05
3	14	0.657	9.20	0.609	8.53
4	14	0.572	8.01	0.516	7.22
5	114	0.497	<u>56.66</u>	0.437	<u>49.82</u>
			<u>6.63</u>		<u>-2.52</u>

Now we use interpolation formula

$$15\% + \frac{6.63}{6.63 - (-2.52)} \times 3\%$$

$$15\% + \frac{6.63}{9.15} \times 3\% = 15\% + 2.17\%$$

YTM = 17.17%

Note: Students can also compute the YTM using rates other than 15% and 18%.

(ii) The duration can be calculated as follows:

Year	Cash Flow	PVF@ 17.17%	PV @ 17.17%	Proportion of NCD value	Proportion of NCD value × time
1	14	0.853	11.942	0.1328	0.1328
2	14	0.728	10.192	0.1134	0.2268
3	14	0.622	8.708	0.0968	0.2904
4	14	0.531	7.434	0.0826	0.3304
5	114	<u>0.453</u>	<u>51.642</u>	0.5744	<u>2.8720</u>
			89.918		<u>3.8524</u>

Duration = 3.8524 years.

(iii) Realized Yield can be calculated as follows:

$$\frac{(14 \times 5) + 100}{(1+R)^5} = 90$$

$$(1+R)^5 = \frac{170}{90} \quad R = \left(\frac{170}{90} \right)^{1/5} - 1 = 0.1356 \text{ or } 13.56\%$$

Question 41

- (a) Consider two bonds, one with 5 years to maturity and the other with 20 years to maturity. Both the bonds have a face value of ₹ 1,000 and coupon rate of 8% (with annual interest payments) and both are selling at par. Assume that the yields of both the bonds fall to 6%, whether the price of bond will increase or decrease? What percentage of this increase/decrease comes from a change in the present value of bond's principal amount and what percentage of this increase/decrease comes from a change in the present value of bond's interest payments?
- (b) Consider a bond selling at its par value of ₹ 1,000, with 6 years to maturity and a 7% coupon rate (with annual interest payment), what is bond's duration?

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- (c) If the YTM of the bond in (b) above increases to 10%, how it affects the bond's duration? And why?

Answer

- (a) If the yield of the bond falls the price will always increase. This can be shown by following calculation.

IF YIELD FALLS TO 6%

Price of 5yr. bond

$$₹ 80 (\text{PVIFA } 6\%, 5\text{yrs.}) + ₹ 1000 (\text{PVIF } 6\%, 5\text{yrs.})$$

$$₹ 80 (4.212) + ₹ 1000 (0.747)$$

$$₹ 336.96 + ₹ 747.00 = ₹ 1,083.96$$

Increase in 5 year's bond price = ₹ 83.96

Current price of 20 year bond

$$₹ 80 (\text{PVIFA } 6\%, 20) + ₹ 1,000 (\text{PVIF } 6\%, 20)$$

$$₹ 80 (11.47) + ₹ 1,000 (0.312)$$

$$₹ 917.60 + ₹ 312.00 = ₹ 1229.60$$

So increase in bond price is ₹ 229.60

PRICE INCREASE DUE TO CHANGE IN PV OF PRINCIPAL

5 yrs. Bond

$$₹ 1,000 (\text{PVIF } 6\%, 5) - ₹ 1,000 (\text{PVIF } 8\%, 5)$$

$$₹ 1,000 (0.747) - ₹ 1,000 (0.681)$$

$$₹ 747.00 - ₹ 681.00 = ₹ 66.00$$

& change in price due to change in PV of Principal

$$(₹ 66 / ₹ 83.96) \times 100 = 78.6\%$$

20 yrs. Bond

$$₹ 1,000 (\text{PVIF } 6\%, 20) - ₹ 1,000 (\text{PVIF } 8\%, 20)$$

$$₹ 1,000 (0.312) - ₹ 1,000 (0.214)$$

$$₹ 312.00 - ₹ 214.00 = ₹ 98.00$$

& change in price due to change in PV of Principal

$$(₹ 98 / ₹ 229.60) \times 100 = 42.68\%$$

PRICE CHANGE DUE TO CHANGE IN PV OF INTEREST

5 yrs. Bond

$$₹ 80 \text{ (PVIFA 6\%, 5)} - ₹ 80 \text{ (PVIFA 8\%, 5)}$$

$$₹ 80 (4.212) - ₹ 80 (3.993)$$

$$₹ 336.96 - ₹ 319.44 = ₹ 17.52$$

$$\% \text{ change in price} = \frac{₹ 17.52}{₹ 83.96} \times 100 = 20.86\%$$

20 yrs. Bond

$$₹ 80 \text{ (PVIFA 6\%, 20)} - ₹ 80 \text{ (PVIFA 8\%, 20)}$$

$$₹ 80 (11.47) - ₹ 80 (9.82)$$

$$₹ 917.60 - ₹ 785.60 = ₹ 132$$

$$\& \text{ change in price} = \frac{₹ 132}{₹ 229.60} \times 100 = 57.49\%$$

(b) Duration in the average time taken to recollect back the investment

Years (A)	Coupon Payments (₹)	Redemption (₹)	Total (₹) (B)	PVIF @ 7% (₹) (C)	(A)x(B)x (C) (₹)
1	70	-	70	0.935	65.45
2	70	-	70	0.873	122.22
3	70	-	70	0.816	171.36
4	70	-	70	0.763	213.64
5	70	-	70	0.713	249.55
6	70	1000	1070	0.666	<u>4,275.72</u>
				S ABC	<u>5,097.94</u>

$$\text{Duration} = \frac{\Sigma ABC}{\text{Purchase Price}}$$

$$\frac{₹ 5097.94}{₹ 1000} = 5.098 \text{ years}$$

(c) If YTM goes up to 10% , current price of the bond will decrease to

$$₹ 70 \times \text{PVIFA} (10\%, 6) + ₹ 1000 \text{ PVIF} (10\%, 6)$$

$$₹ 304.85 + ₹ 564.00 = ₹ 868.85$$

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Year (A)	Inflow (₹) (B)	PVIF @ 10% (C)	(A)x(B)x (C) (₹)
1	70	0.909	63.63
2	70	0.826	115.64
3	70	0.751	157.71
4	70	0.683	191.24
5	70	0.621	217.35
6	1070	0.564	<u>3,620.88</u>
		SABC	<u>4,366.45</u>

New Duration ₹ 4,366.45/ ₹ 868.85 = 5.025 years

The duration of bond decreases, reason being the receipt of slightly higher portion of one's investment on the same intervals.

Question 42

Closing values of BSE Sensex from 6th to 17th day of the month of January of the year 200X were as follows :

Days	Date	Day	Sensex
1	6	THU	14522
2	7	FRI	14925
3	8	SAT	No Trading
4	9	SUN	No Trading
5	10	MON	15222
6	11	TUE	16000
7	12	WED	16400
8	13	THU	17000
9	14	FRI	No Trading
10	15	SAT	No Trading
11	16	SUN	No Trading
12	17	MON	18000

Calculate Exponential Moving Average (EMA) of Sensex during the above period. The 30 days simple moving average of Sensex can be assumed as 15,000. The value of exponent for 30 days EMA is 0.062.

Give detailed analysis on the basis of your calculations.

Answer

Date	1 Sensex	2 EMA for Previous day	3 1-2	4 3×0.062	5 EMA 2 ± 4
6	14522	15000	(478)	(29.636)	14970.364
7	14925	14970.364	(45.364)	(2.812)	14967.55
10	15222	14967.55	254.45	15.776	14983.32
11	16000	14983.32	1016.68	63.034	15046.354
12	16400	15046.354	1353.646	83.926	15130.28
13	17000	15130.28	1869.72	115.922	15246.202
17	18000	15246.202	2753.798	170.735	15416.937

Conclusion – The market is bullish. The market is likely to remain bullish for short term to medium term if other factors remain the same. On the basis of this indicator (EMA) the investors/brokers can take long position.

Question 43

The closing value of Sensex for the month of October, 2007 is given below:

Date Closing	Sensex Value
1.10.07	2800
3.10.07	2780
4.10.07	2795
5.10.07	2830
8.10.07	2760
9.10.07	2790
10.10.07	2880
11.10.07	2960
12.10.07	2990
15.10.07	3200
16.10.07	3300
17.10.07	3450
19.10.07	3360
22.10.07	3290
23.10.07	3360
24.10.07	3340
25.10.07	3290

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29.10.07	3240
30.10.07	3140
31.10.07	3260

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

Following value can be used :

Value of t at 5% is 2.101 at 18 degrees of freedom

Value of t at 10% is 1.734 at 18 degrees of freedom

Value of t at 5% is 2.086 at 20 degrees of freedom.

Value of t at 10% is 1.725 at 20 degrees of freedom.

Answer

Date	Closing Sensex	Sign of Price Charge
1.10.07	2800	
3.10.07	2780	-
4.10.07	2795	+
5.10.07	2830	+
8.10.07	2760	-
9.10.07	2790	+
10.10.07	2880	+
11.10.07	2960	+
12.10.07	2990	+
15.10.07	3200	+
16.10.07	3300	+
17.10.07	3450	+
19.10.07	3360	-
22.10.07	3290	-
23.10.07	3360	+
24.10.07	3340	-
25.10.07	3290	-
29.10.07	3240	-
30.10.07	3140	-
31.10.07	3260	+

Total of sign of price changes (r) = 8

No of Positive changes = $n_1 = 11$

No. of Negative changes = $n_2 = 8$

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

$$m = \frac{2 \times 11 \times 8}{11 + 8} + 1 = 176/19 + 1 = 10.26$$

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

$$S_r = \sqrt{\frac{(2 \times 11 \times 8)(2 \times 11 \times 8 - 11 - 8)}{(11 + 8)^2(11 + 8 - 1)}} = \sqrt{\frac{176 \times 157}{(19)^2(18)}} = \sqrt{4.252} = 2.06$$

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

Test at 5% level of significance at 18 degrees of freedom using t- table

The lower limit

$$= m - t \times S_r = 10.26 - 2.101 \times 2.06 = 5.932$$

Upper limit

$$= m + t \times S_r = 10.26 + 2.101 \times 2.06 = 14.588$$

At 10% level of significance at 18 degrees of freedom

Lower limit

$$= 10.26 - 1.734 \times 2.06 = 6.688$$

Upper limit

$$= 10.26 + 1.734 \times 2.06 = 13.832$$

As seen r lies between these limits. Hence, the market exhibits weak form of efficiency.

Question 44

The HLL has ₹ 8.00 crore of 10% mortgage bonds outstanding under an open-end scheme. The scheme allows additional bonds to be issued as long as all of the following conditions are met:

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- (1) Pre-tax interest coverage $\frac{\text{Income before tax} + \text{Bond Interest}}{\text{Bond Interest}}$ remains greater than 4.
- (2) Net depreciated value of mortgage assets remains twice the amount of the mortgage debt.
- (3) Debt-to-equity ratio remains below 5.

The HLL has net income after taxes of ₹ 2 crores and a 40% tax-rate, ₹ 40 crores in equity and ₹ 30 crores in depreciated assets, covered by the mortgage.

Assuming that 50% of the proceeds of a new issue would be added to the base of mortgaged assets and that the company has no Sinking Fund payments until next year, how much more 10% debt could be sold under each of the three conditions? Which protective covenant is binding?

Answer

Let x be the crores of Rupees of new 10% debt which would be sold under each of the three given conditions. Now, the value of x under each of the three conditions is as follows:

1. Pre-tax interest coverage $\frac{\text{Income before tax} + \text{Bond Interest}}{\text{Bond Interest}}$ remains greater than 4.

$$\frac{\text{₹ 2 crores} / (1 - 0.4) + 8 \text{ crores} \times 0.1 + x \times 0.1}{(8 \text{ crores} \times 0.1) + (x \times 0.1)} = 4$$

$$\text{Or } \frac{\text{₹ 3.33 crores} + 0.80 \text{ crores} + 0.10x}{(0.80 \text{ crores} + ₹ 0.10x)} = 4$$

$$\text{Or } \frac{\text{₹ 4.13 crores} + 0.10x}{₹ 0.80 \text{ crores} + ₹ 0.10x} = 4$$

$$\text{Or } ₹ 4.13 \text{ crores} + 0.10x = 4 (₹ 0.80 \text{ crores} + ₹ 0.10x)$$

$$\text{Or } ₹ 4.13 \text{ crores} + 0.10x = ₹ 3.2 \text{ crores} + ₹ 0.40x$$

$$\text{Or } ₹ 0.93x = 0.93$$

$$\text{Or } x = ₹ 0.93 / 0.30$$

$$\text{Or } x = ₹ 3.10 \text{ crores}$$

Additional mortgage required shall be a maximum of ₹ 3.10 crores.

2. Net depreciated value of mortgage assets remains twice the amount of mortgage debt
(Assuming that 50% of the proceeds of new issue would be added to the base of mortgaged assets)

$$\text{i.e. } \frac{\text{₹ } 30 \text{ crores} + 0.5x}{\text{₹ } 8 \text{ crores} + x} = 2$$

$$\text{or } \text{₹ } 30 \text{ crores} + 0.5x = 2 (\text{₹ } 8 \text{ crores} + x)$$

$$\text{or } \text{₹ } 1.5x = \text{₹ } 14 \text{ crores}$$

$$\text{or } = \frac{\text{₹ } 14 \text{ crores}}{1.5}$$

$$\text{or } x = 9.33 \text{ crores}$$

Additional mortgage required to satisfy condition No. 2 is ₹ 9.33 crores

3. Debt to equity ratio remains below 5

$$\text{i.e. } \frac{\text{₹ } 8 \text{ crores} + x}{\text{₹ } 40 \text{ crores}} < 5$$

$$\text{or } \text{₹ } 8 \text{ crores} + x = \text{₹ } 200 \text{ crores}$$

$$\text{or } x = \text{₹ } 192 \text{ crores}$$

Since all the conditions are to be met, the least i.e. ₹ 3.10 crores (as per condition – 1) can be borrowed by issuing additional bonds.

Note: Since in the question, it is given that Debt to equity ratio remains below 5, the value of debt is computed by using this condition. However, the new additional debt (x) is exorbitant and is not comparable with the value of new additional debt (x) computed under conditions 1 and 2. For getting the comparable value of new additional debt x the debt to equity ratio should be read as 0.5. Accordingly, value of additional debt would be ₹ 12 crores.

EXERCISES

Question 1

Phototech plc has in issue 9% bonds which are redeemable at their par value of £100 in five years' time. Alternatively, each bond may be converted on that date into 20 ordinary shares of the company. The current ordinary share price of Phototech plc is £4.45 and this is expected to grow at a rate of 6.5% per year for the foreseeable future. Phototech plc has a cost of debt of 7% per year. You are required to calculate the following current values for each £ 100 convertible bond:

- (i) Market value;
- (ii) Floor value; and
- (iii) Conversion premium.

(Answer: (i) £ 123.89 (ii) £ 108.20 (iii) £34.89)

Question 2

On 1 June 2003 the financial manager of Gadgets Corporation's Pension Fund Trust is reviewing strategy regarding the fund. Over 60% of the fund is invested in fixed rate long-term bonds. Interest rates are expected to be quite volatile for the next few years.

Among the pension fund's current investments are two AAA rated bonds:

- 1) Zero coupon June 2018
- 2) 12% Gilt June 2018 (interest is payable semi-annually)

The current annual redemption yield (yield to maturity) on both bonds is 6%. The semi-annual yield may be assumed to be 3%. Both bonds have a par value and redemption value of \$100. You are required to estimate the market price of each of the bonds if interest rates (yields):

- (i) increase by 1%;
- (ii) decrease by 1%.

[Given $PVF(2.5\%, 30) = 0.4767$, $PVF(3\%, 30) = 0.412$, $PVF(3.5\%, 30) = 0.3563$]

[Answer: (i) Zero Coupon Bond-13.1% (Decrease) & 12% Gilt June 2018- 8.1% (Decrease) (ii) Zero Coupon Bond-15.3% (Increase) & 12% Gilt June 2018- 9.1% (Increase)]

Question 3

It is now January 1, 2009, and Mr. X is considering the purchase of an outstanding Municipal Corporation bond that was issued on January 1, 2007, the Municipal bond has a 9.5 percent annual coupon and a 30-year original maturity (it matures on December 31, 2037). Interest rates have declined since the bond was issued, and the bond now is selling at 116.575 % of par, or ₹1,165.75. Determine the yield to maturity (YTM) of this bond for Mr. X.

(Answer: 8.22%)