

Capital Markets - Portfolio Management

Portfolio management refers to the selection of securities and their continuous shifting in the portfolio for optimizing the return for investor. It is concerned with efficient management of portfolio investment in financial assets, including shares and debentures of companies.

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Basic principles of effective portfolio management

- (a) Portfolio management refers to the selection of securities and their continuous shifting in the portfolio to optimize returns to suit the objectives of the investor.

The two basic principles for effective portfolio management are:

- (i) Effective investment planning for the investment in securities by considering the following factors:
 - (a) Fiscal, financial and monetary policies of the Government of India and the Reserve Bank of India.
 - (b) Industrial and economic environment and its impact on industry prospects in terms of prospective technological changes, competition in the market, capacity utilization with industry and demand prospects etc.
- (ii) Constant review of investment: Portfolio managers are required to review their investment in securities on a continuous basis to identify more profitable avenues for selling and purchasing their investment. For this purpose they will have to carry the following analysis:
 - (a) Assessment of quality of management of the companies in which investment has already been made or is proposed to be made.
 - (b) Financial and trend analysis of companies' balance sheets/ profits and loss accounts to identify sound companies with optimum capital structure and better performance and to disinvest the holding of those companies whose performance is found to be slackening.
 - (c) The analysis of securities market and its trend is to be done on a continuous basis.

The above analysis will help the portfolio manager to arrive at a conclusion as to whether the securities already in possession should be disinvested and new securities be purchased. This analysis will also reveal the timing for investment or disinvestment.

Factors affecting investment decisions in portfolio management

- (i) **Objectives of investment portfolio:** There can be many objectives of making an investment. The manager of a provident fund portfolio has to look for security (low risk) and may be satisfied with none too higher return. An aggressive investment company may, however, be willing to take a high risk in order to have high capital appreciation.
- (ii) **Selection of investment:**
 - (a) What types of securities to buy or invest in? There is a wide variety of investments opportunities available i.e. debentures, convertible bonds, preference shares, equity shares, government securities and bonds, income units, capital units etc.
 - (b) What should be the proportion of investment in fixed interest/dividend securities and variable interest/dividend bearing securities?
 - (c) In case investments are to be made in the shares or debentures of companies, which particular industries show potential of growth?
 - (d) Once industries with high growth potential have been identified, the next step is to select the particular companies, in whose shares or securities investments are to be made.
- (iii) **Timing of purchase:** The timing of purchase is very crucial. At what price the share is acquired for the portfolio depends entirely on the timing decision. It is obvious if a person wishes to make any gains, he should “buy cheap and sell dear” i.e. buy when the shares are selling at a low price and sell when they are at a high price. Timing the purchase is very difficult as it is not easy to predict the movements of securities in the market.

Objectives of portfolio management

- (i) **Security/safety of principal:** Security not only involves keeping the principal sum intact but also keeping intact its purchasing power.
- (ii) **Stability of income:** So as to facilitate planning more accurately and systematically the reinvestment or consumption of income.
- (iii) **Capital growth:** It can be attained by reinvesting in growth securities or through purchase of growth securities.
- (iv) **Marketability:** The ease with which security can be bought or sold. This is essential to provide flexibility to investment portfolio.
- (v) **Liquidity:** It is desirable for an investor to take advantage of attractive opportunities in the market.
- (vi) **Diversification:** The basic objective of building a portfolio is to reduce the risk of loss of capital/income by investing in various types of securities and over a wide range of industries.

- (vii) *Favourable tax status*: The effective yield an investor gets from his investment depends on tax to which it is subjected. By minimizing tax burden, yield can be improved effectively.

Various risks associated with portfolio management

1. *Interest rate risk*: It is due to changes in interest rates from time to time. Other things being equal, price of the security moves inversely with the change in rate of interest.
2. *Purchasing power risk*: Increase in inflation reduces the purchasing power. Inflation rates vary over time and are directly related to interest rates.
3. *Business risk*: It arises from risk of doing business in a particular industry or environment.
4. *Financial risk*: This arises due to changes in the capital structure of the company. It is expressed in terms of debt-equity ratio. The more the proportion of debt financing in a company's capital structure, the greater is the financial risk.

Investment Strategy

Active Strategy vs. Passive Strategy

Active management is simply an attempt to "beat" the market as measured by a particular benchmark or index. The S&P 500 Index and the Russell 1000 Index are examples of two indexes that gauge the performance of the large-cap U.S. stock market — the so-called "blue chip" stocks. Similarly the NSE NIFTY 50 and BSE SENSEX 30 attempt to measure the performance of large cap Indian stock market.

Prevailing market trends, the economy, political and other current events, and company-specific factors (such as earnings growth) all affect an active manager's decisions. The aim of active fund management — after fees are paid — is to outperform the index.

Passive management is more commonly called indexing. Indexing is an investment management approach based on investing in exactly the same securities, in the same proportions, as an index. The Passive strategy is characterized by long term horizon and little portfolio revisions.

It is debatable which investment approach is better. Proponents of each believe that their approach is the right one, the one that has the potential to generate the greatest amount of return over the long term.

Fundamental Analysis

Fundamental analysis is a technique that attempts to determine a security's value by focusing on underlying factors that affect a company's actual business and its future prospects. The term simply refers to the analysis of the financials of an entity as opposed to its price

movements.

Fundamentals: Quantitative and Qualitative

The various fundamental factors can be grouped into two categories: quantitative and qualitative.

- * Quantitative – capable of being measured or expressed in numerical terms.
- * Qualitative – related to or based on the quality or character

Value investors who follow fundamental analysis look at both qualitative (business model, governance, target market factors etc.) and quantitative (ratios, financial statement analysis, etc.) aspects of a business to see if the business is currently out of favor with the market or is really worth much more than its current valuation.

Fundamental analysis starts with financial statement analysis that includes ratios.

- a. It looks at dividends paid, operating cash flow, equity issues, capital financing etc.,
- b. The growth rates (of income and cash) and risk levels (to determine the discount rate) are used in various valuation models. The foremost is the discounted cash flow model, which calculates the present value of the future
- c. The amount of debt is also a major consideration in determining a company's health. It can be quickly assessed using the debt to equity ratio and the current ratio (current assets/current liabilities).

Top-down or Bottom-up approach in Fundamental analysis

- a. The top-down investor starts his analysis with global economics, including both international and national economic indicators, such as GDP growth rates, inflation, interest rates, exchange rates, productivity, and energy prices. Then regional/industry analysis of total sales, price levels, the effects of competing products, foreign competition, and entry or exit from the industry is taken up. At the end, the Company analysis is done.
- b. The bottom-up investor starts with specific businesses, regardless of their industry/region.

Quantitative vs. Qualitative

Neither qualitative nor quantitative analysis is better than the other. Instead, many analysts consider qualitative factors in conjunction with quantitative factors. Take the Coca-Cola Company, for example. When examining its stock, an analyst might look at the stock's annual dividend payout, earnings per share, P/E ratio and many other quantitative factors. However, no analysis of Coca-Cola would be complete without taking into account its brand recognition. It's tough to put a number to exactly what the Coke brand is worth.

Criticisms of Fundamental Analysis

The biggest criticisms of fundamental analysis come primarily from two groups: proponents of technical analysis and believers of the “efficient market hypothesis”.

The efficient market hypothesis contends that it is essentially impossible to produce market-beating returns in the long run, through either fundamental or technical analysis. The rationale for this argument is that, since the market efficiently prices all stocks on an ongoing basis, any opportunities for excess returns derived from fundamental (or technical) analysis would be almost immediately whittled away by the market’s many participants, making it impossible for anyone to outperform the market over the long term.

The Concept of Intrinsic Value

One of the primary assumptions of fundamental analysis is that the price on the stock market does not fully reflect a stock’s “real” or intrinsic value.

Intrinsic value is the actual value of a company or an asset based on an underlying perception of its true value including all aspects of the business, in terms of both tangible and intangible factors. This value may or may not be the same as the current market value. Value investors use a variety of analytical techniques in order to estimate the intrinsic value of securities in hopes of finding investments where the true value of the investment exceeds its current market value.

The second major assumption of fundamental analysis is that in the long run, the stock market will reflect the fundamentals. There is no point in buying a stock based on intrinsic value if the price never reflected that value.

This is what fundamental analysis is all about. By focusing on a particular business, an investor can estimate the intrinsic value of a firm and thus find opportunities where he can buy at a discount. If all goes well, the investment will pay off over time as the market catches up to the fundamentals.

Value Investing

Value investing is an investment paradigm that derives from the ideas on investment and speculation that Benjamin Graham & David Dodd began teaching at Columbia Business School in 1928 and subsequently developed in their 1934 book ‘Security Analysis’.

Value Investing primarily refers to the strategy of selecting stocks that trade for less than their intrinsic values. Value investors actively seek stocks of companies that they believe are undervalued. They believe the market overreacts to good and bad news, resulting in stock price movements that do not correspond with the company's long-term fundamentals. The result is an opportunity for value investors to profit by buying when the price is deflated.

Typically, value investors select stocks with lower-than-average price-to-book or price-to-earnings ratios or price-to-cash-flow ratio stocks and/or high dividend yields.

Numerous academic studies have consistently found that value stocks outperform growth stocks and the market as a whole in the long term.

Followers of value investing, including Berkshire Hathaway chairman Warren Buffett, have argued that the essence of value investing is buying stocks at less than their intrinsic value.

Although value investing has taken many forms since its inception, it generally involves buying securities whose shares appear underpriced by some form of fundamental analysis. Such securities may be stock in public companies that trade at discounts to book value or tangible book value, have high dividend yields, have low price-to-earnings multiples or have low price-to-book ratios.

Dow Jones Theory

Charles Dow developed the Dow Theory from his analysis of market price action. Even though Charles Dow is credited with developing the Dow Theory, it was S.A. Nelson and William Hamilton who later refined the theory into what it is today.

According to this theory - “The market is always considered as having three movements, all going at the same time.”

- a) Daily Fluctuations – This is the narrow movement from day to day.
- b) Secondary movement – This is the short swing running from two weeks to a month or more and
- c) Primary movement – This is the main movement, covering at least 4 years in its duration.

Primary Movements: They reflect the trend of the stock market from last one year to four years or sometimes even more. On study of the long range behaviour of market prices, it has been empirically observed that share prices go through definite phases, where the prices are either consistently rising or falling. These phases are popularly known as bull and bear phases. So long as each successive rally or price advance reaches a higher level than the one before it, and each secondary reaction, or price decline, stops at a higher level than the previous one, primary trend is up. This is called a “Bull Market”. When each intermediate decline carries prices to successively lower levels and each intervening rally fails to bring them back up to the top level of the preceding rally, the trend is down. This is called a “Bear Market”. Popularly Bull market is known by formation of “Higher Tops and Higher Bottoms”, and Bear Market is known by formation of “Lower Tops and Lower Bottoms”.

Secondary Movements: The secondary trends are intermediate declines or “corrective phase”, which occur in bull market and intermediate rallies which occur in bear markets. Normally they last from 4 weeks to 13 weeks. Generally it retraces 33.33% or 66.66% of primary movements. It is imperative to note here that secondary movements are always in opposite direction of the primary movements.

Daily Movements: They 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 on account of speculative factors.

Random walk hypothesis

The theory was popularized by the 1973 book, *A Random Walk Down Wall Street*, by Burton Malkiel, and was used earlier in Eugene Fama's 1965 article *Random Walks In Stock Market Prices*.

Random walk is a stock market theory that states that the past movement or direction of the price of a stock or overall market cannot be used to predict its future movement. In short, random walk says that stocks take a random and unpredictable path. The chance of a stock's future price going up is the same as it going down. A follower of random walk believes it is impossible to outperform the market without assuming additional risk. The theory preaches that both technical analysis and fundamental analysis are largely a waste of time and are still unproven in outperforming the markets.

According to this theory, stock prices exactly behave in a way in which a drunken person would behave while walking in a blind lane.

Efficient market hypothesis (EMH)

The efficient-market hypothesis was developed by Professor Eugene Fama as an academic concept of study. It was widely accepted up until the 1990s, when behavioral finance economists, who were a fringe element, became main stream. Empirical analysts have consistently found problems with the efficient-market hypothesis, the most consistent being that stocks with low price to earnings (and similarly, low price to cash-flow or book value) outperform other stocks. Although the efficient-market hypothesis has become controversial because substantial and lasting inefficiencies are observed, experts consider that it remains a worthwhile starting point.

Efficient market hypothesis (EMH) states that it is impossible to beat the market because prices already incorporate and reflect all relevant information. This is also a highly controversial and often disputed theory. Supporters of this model believe it is pointless to search for undervalued stocks or try to predict trends in the market through fundamental analysis or technical analysis.

Under the efficient market hypothesis, any time one buys and sells securities, he is engaging in a game of chance, not skill. If markets are efficient and current, it means that prices always reflect all information, so there is no way one will be able to buy a stock at a bargain price.

Technical analysis

Technical analysis is a method of evaluating securities by analyzing the statistics generated by market activity, such as past prices and volume. Technical analysts do not attempt to measure a security's intrinsic value, but instead use charts and other tools to identify patterns that can suggest future activity.

There are also many different types of technical traders. Some rely on chart patterns; others use technical indicators and oscillators, and most use some combination of the two. In any case, technical analysts' exclusive use of historical price and volume data is what separates

them from their fundamental counterparts. Unlike fundamental analysts, technical analysts don't care whether a stock is undervalued - the only thing that matters is a security's past trading data and what information this data can provide about where the security might move in the future.

The field of technical analysis is based on three assumptions:

1. The market discounts everything.
2. Price moves in trends.
3. History tends to repeat itself.

1. The Market Discounts Everything

Technical analysis assumes that, at any given time, a stock's price reflects everything that has or could affect the company - including fundamental factors. Technical analysts believe that the company's fundamentals, along with broader economic factors and market psychology, are all priced into the stock, removing the need to actually consider these factors separately. This only leaves the analysis of price movement, which technical theory views as a product of the supply and demand for a particular stock in the market.

2. Price Moves in Trends

In technical analysis, price movements are believed to follow trends. This means that after a trend has been established, the future price movement is more likely to be in the same direction as the trend than to be against it. Most technical trading strategies are based on this assumption.

3. History Tends To Repeat Itself

Another important idea in technical analysis is that history tends to repeat itself, mainly in terms of price movement. The repetitive nature of price movements is attributed to market psychology; in other words, market participants tend to provide a consistent reaction to similar market stimuli over time. Technical analysis uses chart patterns to analyze market movements and understand trend.

Trends

One of the most important concepts in technical analysis is that of trend. A trend is nothing more than the general direction in which a security or market is headed.

In technical analysis, price movements are believed to follow trends. This means that after a trend has been established, the future price movement is more likely to be in the same direction as the trend than to be against it. Most technical trading strategies are based on this assumption.

In technical analysis, it is the movement of the highs and lows that constitutes a trend. For example, an uptrend is classified as a series of higher highs and higher lows, while a downtrend is one of lower highs and lower lows.

Types of Trend

There are three types of trend:

- Uptrend
- Downtrends
- Sideways/Horizontal Trends: When there is little movement up or down in the peaks and troughs, it's a sideways or horizontal trend.

TrendLengths

A trend of any direction can be classified as a long-term trend, intermediate trend or a short-term trend. In terms of the stock market, a major trend is generally categorized as one lasting longer than a year. An intermediate trend is considered to last between one and three months and a near-term trend is anything less than a month. A long-term trend is composed of several intermediate trends, which often move against the direction of the major trend. If the major trend is upward and there is a downward correction in price movement followed by a continuation of the uptrend, the correction is considered to be an intermediate trend. The short-term trends are components of both major and intermediate trends.



Trendlines

A trendline is a simple charting technique that adds a line to a chart to represent the trend in the market or a stock. Drawing a trendline is as simple as drawing a straight line that follows a general trend. Trendlines are used to clearly show the trend and are also used in the identification of trend reversals.

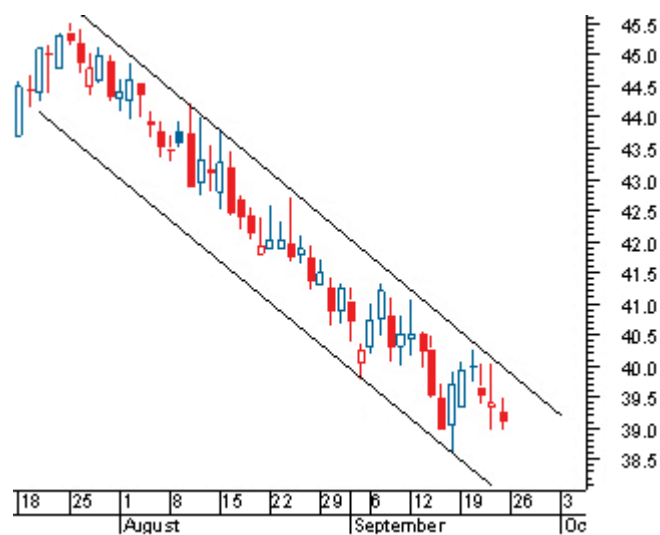
An upward trendline is drawn at the lows of an upward trend. This line represents the support the stock has every time it moves from a high to a low. This type of trendline helps traders to anticipate the point at which a stock's price will begin moving upwards again. Similarly, a downward trendline is drawn at the highs of the downward trend. This line represents the

resistance level that a stock faces every time the price moves from a low to a high.



Channels

A channel, or channel lines, is the addition of two parallel trendlines that act as strong areas of support and resistance. The upper trendline connects a series of highs, while the lower trendline connects a series of lows. A channel can slope upward, downward or sideways but, regardless of the direction, the interpretation remains the same. Traders will expect a given security to trade between the two levels of support and resistance until it breaks beyond one of the levels, in which case traders can expect a sharp move in the direction of the break. Along with clearly displaying the trend, channels are mainly used to illustrate important areas of support and resistance.

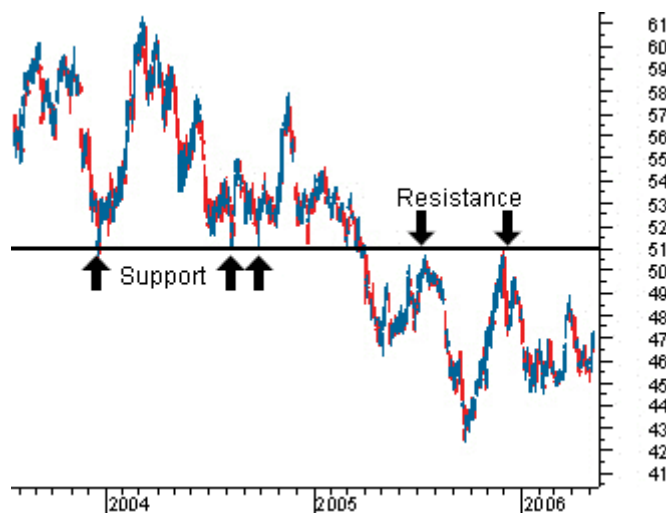


The above figure illustrates a descending channel on a stock chart; the upper trendline has been placed on the highs and the lower trendline is on the lows. The price has bounced off of these lines several times, and has remained range-bound for several months. As long as the price does not fall below the lower line or move beyond the upper resistance, the range-bound downtrend is expected to continue.

Support and Resistance

Support is the price level at which demand is thought to be strong enough to prevent the price from declining further. As the price declines towards support and gets cheaper, buyers become more inclined to buy and sellers become less inclined to sell. By the time the price reaches the support level, it is believed that demand will overcome supply and prevent the price from falling below support.

Support does not always hold and a break below support signals that the bears have won out over the bulls. A decline below support indicates a new willingness to sell and/or a lack of incentive to buy. Support breaks and new lows signal that sellers have reduced their expectations and are willing to sell at even lower prices. In addition, buyers could not be coerced into buying until prices declined below support or below the previous low. Once support is broken, another support level will have to be established at a lower level.



Resistance is the price level at which selling is thought to be strong enough to prevent the price from rising further. As the price advances towards resistance, sellers become more inclined to sell and buyers become less inclined to buy. By the time the price reaches the resistance level, it is believed that supply will overcome demand and prevent the price from rising above resistance.

Resistance does not always hold and a break above resistance signals that the bulls have won out over the bears. A break above resistance shows a new willingness to buy and/or a lack of incentive to sell. Resistance breaks and new highs indicate buyers have increased their

expectations and are willing to buy at even higher prices. In addition, sellers could not be coerced into selling until prices rose above resistance or above the previous high. Once resistance is broken, another resistance level will have to be established at a higher level.

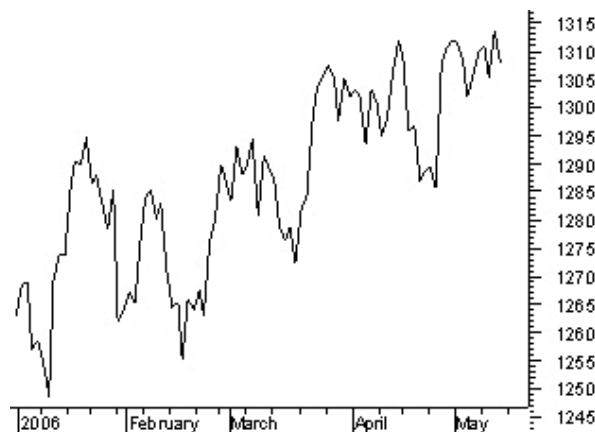
As long as the price of the share remains between these levels of support and resistance, the trend is likely to continue. It is important to note, however, that a break beyond a level of support or resistance does not always have to be a reversal. For example, if prices moved above the resistance levels of an upward trending channel, the trend has accelerated, not reversed. This means that the price appreciation is expected to be faster than it was in the channel.

Chart Types

There are three main types of charts that are used by investors and traders are: the line chart, the bar chart and the candlestick chart

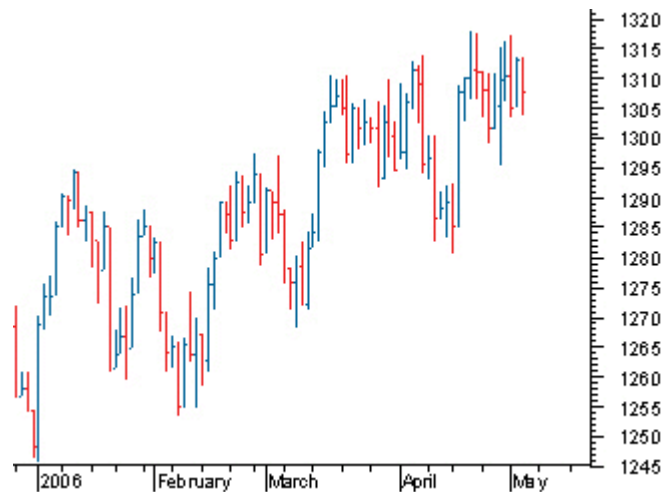
Line Chart

The most basic of the four charts is the line chart because it represents only the closing prices over a set period of time. The line is formed by connecting the closing prices over the time frame. Line charts do not provide visual information of the trading range for the individual points such as the high, low and opening prices. However, the closing price is often considered to be the most important price in stock data compared to the high and low for the day.



Bar Charts

Bar chart expands on the line chart by adding several more key pieces of information to each data point. The chart is made up of a series of vertical lines that represent each data point. This vertical line represents the high and low for the trading period, along with the closing price. The close and open are represented on the vertical line by a horizontal dash. The opening price on a bar chart is illustrated by the dash that is located on the left side of the vertical bar. Conversely, the close is represented by the dash on the right.



Candlestick Chart

The candlestick chart is similar to a bar chart, but it differs in the way that it is visually constructed. Similar to the bar chart, the candlestick also has a thin vertical line showing the period's trading range. The difference comes in the formation of a wide bar on the vertical line, which illustrates the difference between the open and close.

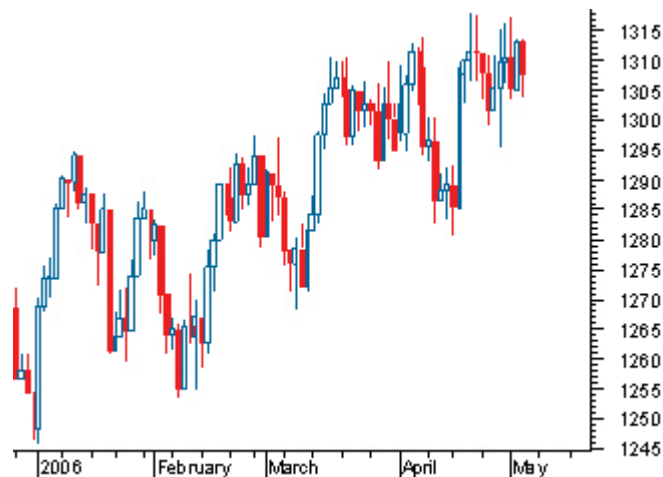


Chart Pattern

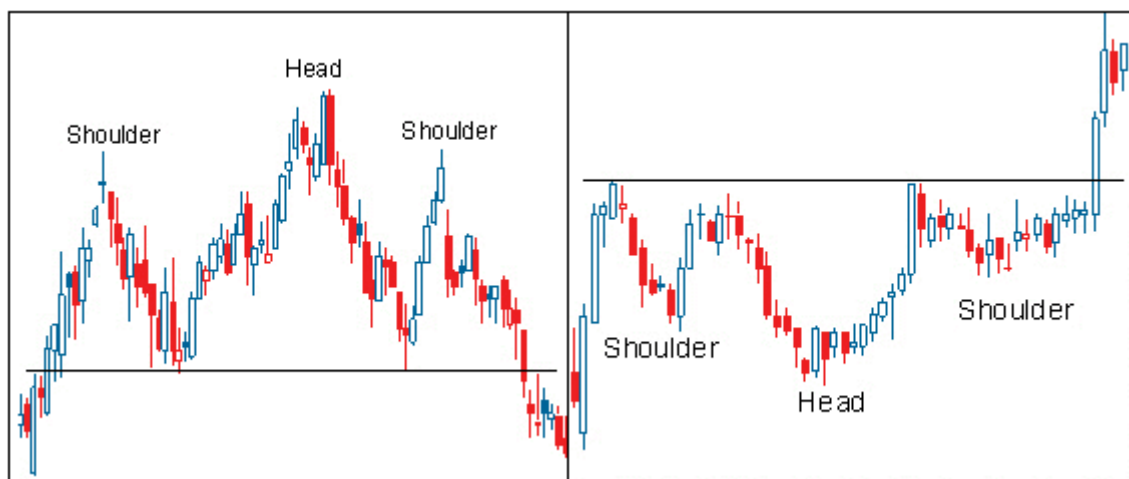
A chart pattern is a distinct formation on a stock chart that creates a trading signal, or a sign of future price movements. Chartists use these patterns to identify current trends and trend reversals and to trigger buy and sell signals. Based on the historic trend of a chart pattern setting up a certain price movement, chartists look for these patterns to identify trading opportunities.

Gaps

A gap in a chart is an empty space between a trading period and the following trading period. This occurs when there is a large difference in prices between two sequential trading periods. For example, if the trading range in one period is between Rs. 25 and Rs. 40 and the next trading period opens at Rs. 60, there will be a large gap on the chart between these two periods. Gap price movements can be found on bar charts and candlestick charts but will not be found on point and figure or basic line charts. Gaps generally show that something of significance has happened in the security, for eg: good earnings announcement

Head and Shoulders

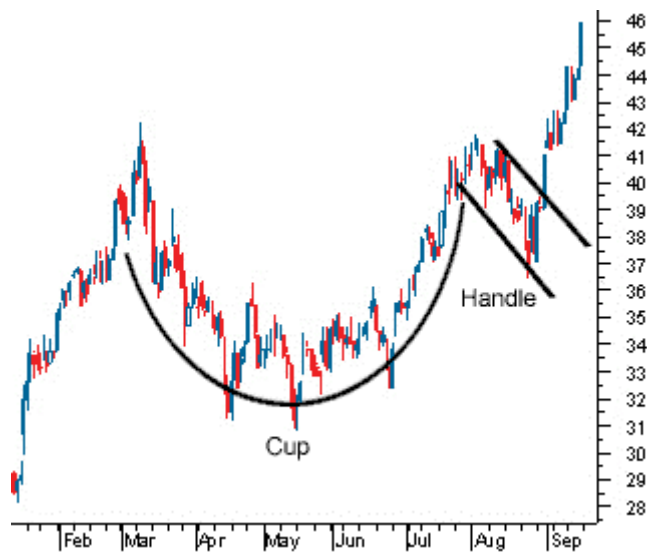
This is one of the most popular and reliable chart patterns in technical analysis. Head and shoulders is a reversal chart pattern that when formed, signals that the security is likely to move against the previous trend. As shown in figure below, there are two versions of the head and shoulders chart pattern. Head and shoulders top (on the left) is a chart pattern that is formed at the high of an upward movement and signals that the upward trend is about to end. Head and shoulders bottom, also known as inverse head and shoulders (on the right) is the lesser known of the two, but is used to signal a reversal in a downtrend.



Cup and Handle

A cup and handle chart is a bullish continuation pattern in which the upward trend has paused but will continue in an upward direction once the pattern is confirmed.

This price pattern forms what looks like a cup, which is preceded by an upward trend. The handle follows the cup formation and is formed by a generally downward/sideways movement in the security's price. Once the price movement pushes above the resistance lines formed in the handle, the upward trend can continue. There is a wide ranging time frame for this type of pattern, with the span ranging from several months to more than a year.



Wedge

A wedge is formed

- When the tops (resistance levels) and bottoms (support) change in opposite direction (i.e. if tops are increasing then the bottoms would be decreasing and vice versa) or
- When they are changing in the same direction at different rates over time.

Risk Return Analysis

Return and Risk of Single Asset:

Annual Rate of return: The annual rate of return of a particular investment can be calculated as follows:

$$R = \frac{D_1}{P_0} + \frac{P_1 - P_0}{P_0} = \frac{D_1 + (P_1 - P_0)}{P_0}$$

Where,

R = Annual rate of return of a share

D_1 = Dividend paid at the end of the year

P_0 = Market price of share at the beginning of the year

P_1 = Market price of share at the end of the year

In the above formula,

D_1/P_0 represents dividend yield, and

$(P_1 - P_0)/P_0$ represents capital gain or loss.

Average Rate of Return

The rate of return can also be calculated for a period more than one year. The average rate of return represents the average of annual rates of return over a period of years. The formula used for calculation of average rate of return is given below:

$$R = \frac{1}{N} (R_1 + R_2 + \dots + R_n)$$

Where, R = Average rate of return

R₁, R₂...R_n = Annual rate of return in period 1, 2, ..., n

n = Total number of periods

Risk

Risk plays a very important role in the decision making process for both investors and companies, so it is important that the level of risk associated with the investment to be quantified. Risk is measured by Standard Deviation of returns of the security, calculated using historical returns or expected returns (probabilities) in the future

Using historical returns

$$\text{Variance } (\sigma^2) = \frac{\sum (R - \bar{R})^2}{N}$$

$$\text{Standard Deviation } \sigma = \sqrt{\frac{\sum (R - \bar{R})^2}{N}}$$

Risk and Expected Return using Probabilities

$$\text{Expected return } (\bar{R}) = \sum (P \times R)$$

$$\text{Variance } \sigma^2 = \sum p \times (R - \bar{R})^2$$

$$\text{Standard Deviation } \sigma = \sqrt{\sum p \times (R - \bar{R})^2}$$

Coefficient of Variation – A relative measure of risk

In some cases, standard deviation can be misleading. A widely used relative measure of risk is coefficient of variation

$$\text{Co-efficient of variation} = \frac{\sigma}{\bar{R}}$$

Modern Portfolio Theory

Modern portfolio theory (MPT) was introduced by Harry Markowitz with his paper "Portfolio Selection." Modern portfolio theory (MPT) proposes how rational investors will use diversification to optimize their portfolios, and how a risky asset should be priced.

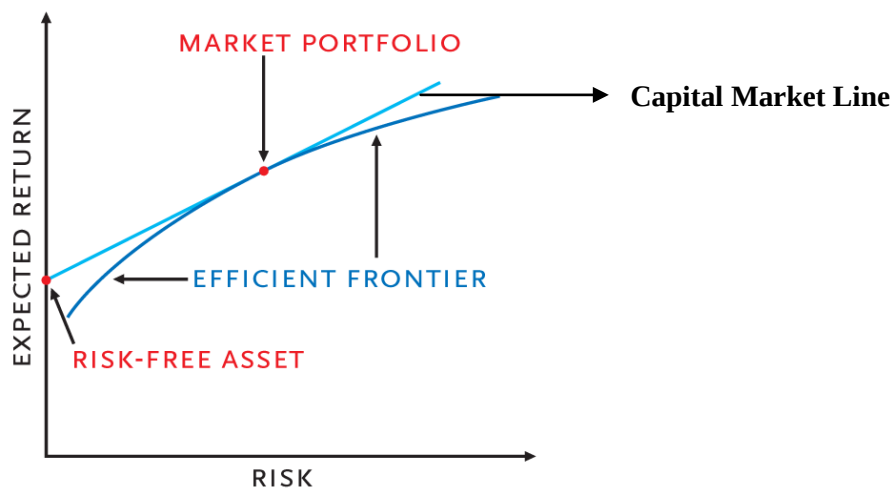
The risk of a portfolio comprises of systematic (non-diversifiable risk) and unsystematic risk (diversifiable risk). The possibility of investors reducing unsystematic risk through holding diversified portfolio of securities forms the basis of Markowitz's portfolio theory.

Prior to Markowitz, investors focused on assessing the risks and rewards of individual securities in constructing their portfolios. Standard investment advice was to identify those securities that offered the best opportunities for gain with the least risk and then construct a portfolio from these. Detailing mathematics of diversification, Markowitz proposed that investors focus on selecting portfolios based on their overall risk-reward characteristics instead of merely compiling portfolios from securities that individually have attractive risk-reward characteristics. In a nutshell, investors should select portfolios not individual securities.

MPT models an asset's return as a random variable, and models a portfolio as a weighted combination of assets so that the return of a portfolio is the weighted combination of the assets' returns. Moreover, a portfolio's return is a random variable, and consequently has an expected value and a variance. Risk, in this model, is the standard deviation of return.

Assumptions:

- i. The model assumes that investors are risk averse, meaning that given two assets that offer the same expected return, investors will prefer the less risky one. The implication is that a rational investor will not invest in a portfolio if a second portfolio exists with a more favorable risk-return profile – i.e., if for that level of risk an alternative portfolio exists which has better expected returns.
- ii. Only the expected return and the volatility (i.e., mean return and standard deviation) matter to the investor.



Efficient Frontier

The efficient portfolio is one, which provides the maximum expected return for any particular degree of risk or the lowest possible degree of risk for any given rate of return. In other words, there is no other portfolio available which gives a higher return at the same risk; or a lower risk for the same expected return. All portfolios lying on the efficient frontier are called efficient portfolios.

Correlation Coefficient

The extent to which individuals will be able to reduce unsystematic risk using a two share portfolio depends on the correlation that exists between the two shares' returns. The correlation can be quantified by calculating the correlation coefficient (p_{AB}) of the returns of two securities which can take any value in the range of -1 to 1.

If correlation coefficient (p_{AB}) = 1, No unsystematic risk can be diversified

If correlation coefficient (p_{AB}) = -1, All unsystematic risk can be diversified

If correlation coefficient (p_{AB}) = 0, No correlation between two securities returns

Hence, while selecting a two share portfolio it is optimal to choose two securities whose correlation coefficient is close to -1 (perfectly negatively correlated). In practice, it is difficult to find two securities whose correlation coefficient is exactly -1. Thus, diversification does nothing to reduce risk if the portfolio consists of perfectly positively correlated stocks.

The Correlation Coefficient (p_{AB}) can be calculated using the formula:

$$P_{AB} = \frac{\text{Cov}_{AB}}{\sigma_A \sigma_B}$$

Where, Cov_{AB} = Covariance of returns of securities A and B

Formula for Covariance, if historical data is given:

$$\text{Covariance} = \frac{\sum (R_A - \bar{R}_A)(R_B - \bar{R}_B)}{N}$$

(Cov_{AB})

Formula for Covariance, if expected returns (probabilities) are given:

$$\text{Covariance} = \sum p \times (\bar{R}_A - \bar{R}_A)(\bar{R}_B - \bar{R}_B)$$

(Cov_{AB})

Portfolio Return is given by:

$$E(R_p) = w_A E(R_A) + (1 - w_A) E(R_B) = w_A E(R_A) + w_B E(R_B)$$

Portfolio Variance is given by:

$$\sigma_p^2 = w_A^2 \sigma_A^2 + w_B^2 \sigma_B^2 + 2w_A w_B \sigma_A \sigma_B \rho_{AB}$$

Portfolio Diversification:

Portfolio theory developed by Markowitz shows that portfolio risk, unlike portfolio return, is more than just simple aggregation of the risks of individual assets. Scientific diversification of a portfolio can lead to reduction in portfolio risk without reducing portfolio returns.

The overall risk of the portfolio includes the interactive risk of an asset relative to other assets measured in terms of 'covariance'. The covariance in turn depends on the correlation between returns on assets in the portfolio.

An investor can reduce portfolio risk simply by holding combinations of instruments which are not perfectly positively correlated. In other words, investors can reduce their exposure to individual asset risk by holding a diversified portfolio of assets.

Capital Asset Pricing Model

The mechanical complexity of the Markowitz's portfolio model kept both practitioners and academics away from adopting the concept for practical use. Its intuitive logic, however, spurred the creativity of a number of researchers who began examining the stock market implications that would arise if all investors used this model. As a result Capital Asset Pricing Model (CAPM) was developed. After NPV, CAPM is arguably the most important development in Modern Financial Management.

The Capital Assets Pricing Model was developed by Sharpe, Mossin and Lintner in 1960. The model explains the relationship between the expected return, non-diversifiable risk and the valuation of securities. It considers the required rate of return of a security on the basis of its contribution to the total risk. It is based on the premise that the diversifiable risk of a security is eliminated by adding more securities to the portfolio. However, the systematic risk cannot be diversified and is correlated with that of the market portfolio. Therefore, the required rate of return goes with the level of systematic risk. The systematic risk can be measured by beta, β . Under CAPM, the expected return from a security can be expressed as:

Expected return on security = $R_f + \text{Beta} (R_m - R_f)$

The model shows that the expected return of a security consists of the risk-free rate of interest and the risk premium. The CAPM, when plotted on a graph paper is known as the Security Market Line (SML). The SML represents the relationship between the beta and the expected return of a security. This implies that in an efficient market, all securities are expected to yield returns commensurate with their riskiness, measured by β .

The CAPM is based on following eight assumptions:

- (i) The Investor's objective is to maximise the utility of terminal wealth;
- (ii) Investors make choices on the basis of risk and return;
- (iii) Investors have homogenous expectations of risk and return;

- (iv) Investors have identical time horizon;
- (v) Information is freely and simultaneously available to investors;
- (vi) There is a risk-free asset, and investors can borrow and lend unlimited amounts at the risk-free rate;
- (vii) There are no taxes, transaction costs, restrictions on short rates, or other market imperfections;
- (viii) Total asset quantity is fixed, and all assets are marketable and divisible.

CAPM can be used to estimate the expected return of any portfolio with the following formula.

$$E(R_p) = R_f + B_p [E(R_m) - R_f]$$

$E(R_p)$ = Expected return of the portfolio

R_f = Risk free rate of return

B_p = Portfolio beta i.e. market sensitivity index

$E(R_m)$ = Expected return on market portfolio.

$E(R_m) - R_f$ = Market risk premium.

CAPM provides a conceptual framework for evaluating any investment decision where capital is committed with a goal of producing future returns.

The relationship between the beta of a security and the risk and return of the security and the market is given by the following equation:

$$\beta_x = \frac{\text{COV}_{XM}}{\sigma_m^2} = \frac{\sigma_s \times \text{Cor}(X, M)}{\sigma_m}$$

Where:

$$\sigma_m^2 = \frac{\sum (R_M - \bar{R}_M)^2}{n - 1}$$

$$\text{COV}_{X, M} = \frac{\sum (R_X - \bar{R}_X)(R_M - \bar{R}_M)}{n - 1}$$

Systematic Risk

It is the risk which cannot be eliminated by diversification. This part of risk arises because every security has a built in tendency to move in with the fluctuations in the market. The investors are exposed to market risk even when they hold well diversified portfolio of securities. It is because all individual securities move together in the same manner and therefore no investors can avoid or eliminate this risk, whatsoever precautions or diversification may be resorted to.

The examples of systematic risk are:

The government changes the interest rate policy; the corporate tax rate is increased; the government resort to massive deficit financing; the inflation rate increases etc.

Unsystematic Risk

It is the risk which can be eliminated by diversification. This risk represents the fluctuations in return of a security due to factors specific to particular firm only and not to the market as a whole. The investors can totally reduce this risk through diversification. It is because when a large number of securities enter a portfolio, many random fluctuations in returns from these securities will automatically set off each other.

The examples of unsystematic risks are:

Workers declared strike in a company; the Research and Development expert of the company leaves; a formidable competitor enters the market; the company loses a big contract in a bid etc.

Types of Systematic Risk

- (i) *Market risk:* Even if the earning power of the corporate sector and the interest rate structure remain more or less unchanged prices of securities, equity shares in particular, tend to fluctuate. Major cause appears to be the changing psychology of the investors. The irrationality in the security markets may cause losses unrelated to the basic risks. These losses are the result of changes in the general tenor of the market and are called market risks.
- (ii) *Interest Rate Risk:* The change in the interest rate has a bearing on the welfare of the investors. As the interest rate goes up, the market price of existing fixed income securities falls and vice versa. This happens because the buyer of a fixed income security would not buy it at its par value or face value if its fixed interest rate is lower than the prevailing interest rate on a similar security.
- (iii) *Social or Regulatory Risk:* The social or regulatory risk arises, where an otherwise profitable investment is impaired as a result of adverse legislation, harsh regulatory climate, or in extreme instance nationalization by a socialistic government.
- (iv) *Purchasing Power Risk:* Inflation or rise in prices lead to rise in costs of production, lower margins, wage rises and profit squeezing etc. The return expected by investors will change due to change in real value of returns.

Types of Unsystematic Risk

- (i) *Business Risk:* As a holder of corporate securities (equity shares or debentures) one is exposed to the risk of poor business performance. This may be caused by a variety of factors like heightened competition, emergence of new technologies, development of substitute products, shifts in consumer preferences, inadequate supply of essential

inputs, changes in governmental policies and so on. Often of course the principal factor may be inept and incompetent management.

- (ii) *Financial Risk:* This relates to the method of financing, adopted by the company, high leverage leading to larger debt servicing problem or short term liquidity problems due to bad debts, delayed receivables and fall in current assets or rise in current liabilities.
- (iii) *Default Risk:* Default risk refers to the risk accruing from the fact that a borrower may not pay interest and/or principal on time. Except in the case of highly risky debt instrument, investors seem to be more concerned with the perceived risk of default rather than the actual occurrence of default. Even though the actual default may be highly unlikely, they believe that a change in the perceived default risk of a bond would have an immediate impact on its market price.