CHAPTER IV

TECHNICAL ANALYSIS-AN OVERVIEW

4.1 Introduction

An investor in the stock market would be interested in analysing the stock price movements. Prices in the stock market fluctuate due to continuous buying and selling in the market. There are basically two approaches used in analysing the share price movements. They are fundamental approach and technical approach. Both these approaches have the same objective of buying at lower price and selling at a higher price to gain good return on investment. It can be said that the end goal of these two methods are one and the same. However, there exists vast difference between the fundamental concepts of these two methods.

In fundamental analysis the analyst would be concerned with the fundamental factors. He would be interested in determining the true worth or intrinsic value of a share based on its current and future earning capacity. They would buy the share when its market price is below its intrinsic value.

The term "Technical Analysis" is a general heading for myriad of trading techniques. Technical analysis attempts to forecast future prices by the study of past prices and a few other related summary statistics about security trading. A technical analyst is always concerned with the direction of price movements.
Demand and supply equation is the basis of technical analysis. If the demand for a share is greater than its supply the chances of price showing an upward trend is more which prompts the analyst to buy. On the other hand if the supply is more than demand he would sell the particular share or book his profits.

Technical analysis is considered by many to be the original form of investment analysis, dating back to the 1800s. It came into widespread use even before the period of extensive and fully disclosed financial information, which, in turn enabled the practice of fundamental analysis to develop. In the United States, the use of trading rules to detect patterns in stock prices is probably as old as the stock market itself.
Fig. 4.1
Approaches to valuation

Approaches to Valuation

- Fundamental Analysis
  - Earnings Potential (EPS)
    - Earnings Depends on:
      1) Regular Income / Receipts / Dividends
      2) Capital Appreciation / Depreciation
  - Book Value
    \[ \text{Book Value} = \frac{\text{Net Worth}}{\text{No. of Shares}} \]
- Technical Analysis
- Efficient Market Hypothesis (Random Walk Theory)

Intrinsic Value of the Share
The oldest technique of technical analysis is attributed to Charles Dow and is traced to the late 1800s. Many of the techniques used today have been utilized for over 60 years. These techniques for discovering hidden relation in stock returns can range from extremely simple ones to quite elaborate and complicated ones.

The attitude of academicians towards technical analysis till recently is well described by Malkiel (1981). “Obviously, I am biased against the chartist. This is not only a personal predilection, but a professional one as well. Technical analysis is anathema to the academic world. We love to pick on it. Our bullying tactics are prompted by two considerations (1) the method is patently false; and (2) It is easy to pick on. And while it may seem a bit unfair to pick on such a sorry target, just remember; it is your money we are trying to save.”

However, technical analysis has always been enjoying a renaiassance on Wall Street. All major brokerage firms publish technical commentary on the market and individual securities, and many of the newsletters published by various “experts” are based on technical analysis. In recent years the efficient market hypothesis has come under serious siege. Various papers suggested that stock returns are not fully explained by common risk measures. A line of research directly related to this work provides evidence of predictability of equity returns from past returns. In general, the results of these studies are in sharp contrast with earlier studies that supported the random walk hypothesis and concluded that the predictable aviation in equity returns was economically and statistically very small. Two competing explanations for the presence of predictable variation in stock returns have been suggested as: (1) Market inefficiency in which prices take swings from their fundamental values, and (2) Markets are efficient and the
predictable variation can be explained by time varying equilibrium returns. There is no evidence so far that unambiguously distinguishes two competing hypothesis.

Although many earlier studies concluded that technical analysis is useless, the recent studies on predictability of equity returns from past returns suggest that this conclusion might have been premature.

Technical analysis is the process of identifying trend reversal at an early stage and to ride the trend until the weight of evidence suggests that the trend has reversed the directions. The first task of a technical analyst is to ascertain the change in the direction of trend. Trend or direction of price movement is studied with the help of historic price and volume of data. Majority of the technical analysts monitor the price movement on either a daily, weekly or monthly basis.

4.2 Basic Principles of Technical Analysis

The basic principles on which technical analysis is based on may be summarized follows:

a) The most important principle and assumption of technical analysis is that the market discounts everything. It signifies that the price at which the security is quoted represents the hopes, fear, inside information and all other fundamental factors.

b) The market moves in trends and the trends when established, has a tendency to continue further for some time and then reverse at some other point of time.

c) History keeps repeating itself over and again.
d) The market value of a security is related to demand and supply factors operating in the market.

e) Trends in stock prices have been seen to change when there is a shift in the demand and supply factors.

f) There are both rational and irrational factors which surround the supply and demand factors of a security.

g) The shifts in demand and supply can be detected through charts prepared specially to show market action.

h) Patterns which are projected by charts record price movement and these recorded patterns are used by analysts to make forecasts about the movement of prices in future.

i) Action and reaction resulting from buying and selling pressures lead to corrections and rallies to the major up trends and downtrends respectively.

Technical analysis can be very well applied to various markets. The same approach can be adopted in trading in the commodity market, currency market and others of similar type. However one has to understand that there is nothing in the whole world which can be perfectly predicted. That says the relevance of the word “WEIGHT” that is used by a technical analyst. The “WEIGHT” here refers to the conclusion derived by the analyst using various technical analysis tools.
4.3 Dow Theory

Charles Dow who was the editor in of a Wall Street Journal formulated this theory. This theory was presented in a series of editorials in the Wall Street Journal during 1900-1902. According to him stock market does not move on a random basis but is influenced by three distinct cyclical trends which are simultaneous in nature. These movements are primary movements, secondary movements and minor movements.

The primary movement has a long cycle which carries the entire market up or down. Secondary reactions are opposite reactions to the primary movement and it is quoted as the restraining force on the primary movement. This is expected to be present in the market only for a short while. Minor movements are nothing but the day today fluctuations in the market. These three movements have been compared to the tides, the waves and the ripples in the ocean.

Fig. 4.2
Primary trend and secondary reactions

Source: Kevin. S, Portfolio Management, Prentice-Hall of India Pvt Ltd, New Delhi, 2000, P 23
Tools of Technical Analysis

Major tool of technical analysis can be broadly classified as:

- Market Indicators
- Line Studies
- Chart Formations

4.4 Market Indicators

Market indicators are used to gauge the changes in all securities within a specific market. They typically analyse the stock market, although they can be used for other markets like futures. Such indicators add depth to technical analysis because they analyse more information than price and volume. Market indicators broadly fall under three main categories:

- Monetary
- Sentiment
- Momentum

Monetary indicators concentrate on economic data such as interest rates. They help in determining the economic environment in which business operate. Examples of monetary indicators are interest rates, the money supply in the economy.

Sentiment indicators focus on investor expectations even before those expectations discernible in prices. For example “Contrarian” investors use sentiment indicators to determine what the majority of investors expect prices to do
and they do the opposite. Their rationale in this behaviour is that if there are too many people who believe price will rise then there won’t be enough investors left to push prices much higher. The following are the most widely followed surveys which are used to gauge investor sentiments:

- Consumer Confidence Survey
- The American Association of Individual Investors Sentiment Survey
- International Strategy & Investment Investor Survey
- Investor’s Intelligence
- Merrill Lynch Sell side Indicator

The third category of market indicators ie momentum shows what the current momentum of the market is and explains what prices are actually doing. Following are some of most commonly used indicators by technical analysts.

4.4.1 Aroom Indicator

The aroom Indicator was developed by Tushar Chande. Aroom is sanskrit word ‘dawn’s early light’ or the change from night to day. The Aroom Indicator allows anticipating changes in security prices from trending to trading range. These changes are anticipated by measuring the number of periods that have passed since the most recent X-period high and X-period low. The Aroom indicator consists of two plots, one measuring the number of periods since the most recent X-period high (Aroom Up) and the other measuring the number of periods since the most recent X-period low (Aroom Down). The actual plotted value is a “Stochastic” like scale ranging from 0 to 100. Assuming a default time period of 14 days, if a security makes a new 14 day high, the Aroom Up=100; when the security makes a
new 14 day low, the Aroom Down=100. When the security has not made a new high for 14 days, the Aroom Up=0; when the security has not made a new low 14 days, the Aroom Down=0

4.4.2 Commodity Channel Index (CCI)

The Commodity Channel Index (CCI) is calculated by first determining the difference between the mean price of a commodity and the average of the means over the time period chosen. This difference is then compared to the average difference over the time period. The result is then multiplied by a constant that is designed to adjust the CCI so that it fits into a “normal” trading range of +/- 100.

While the CCI was originally designed for commodities the indicator also works very well with stocks and mutual funds.

4.4.3 MACD

The MACD is calculated by subtracting a 26-day moving average of a security’s price from a 12-day moving average of its price. The result is an indicator that oscillates above and below zero. When the MACD is above zero, it means the 12-day moving average is higher than the 26-day moving average. This is bullish as it shows that current expectations (i.e. the 12-day moving average) are more bullish than previous expectations (i.e. the 26-day average). This implies a bullish or upward shift in the supply/demand lines. When the MACD falls below zero, it means that the 12-day moving average is less than the 26-day moving average, implying a bearish shift in the supply/demand lines.
4.4.4 Momentum

The momentum indicator measures the amount of a security’s price that has changed over a given time span. There are basically two ways to use the Momentum Indicator. One as a trend-following oscillator similar to the MACD i.e, buy when the indicator bottoms and turns up and sells when the indicator peaks and turns down. Other way is to use Momentum Indicator as a leading indicator. This method assumes that market tops are typically identified by a rapid price increase (when every one expects prices to go higher) and that market bottoms typically end with rapid price declines (when every one wants to get out).

Momentum indicators are sometimes referred to as Oscillators. The word Oscillator means movement across a reference point. Oscillators are used along with the price chart and never advised to be used in isolation to predict price movements.

4.4.5 Moving Averages

A Moving Average is an indicator that shows the average value of a security’s price over a period of time. When calculating a moving average, a mathematical analysis of the security’s average value over a predetermined time period is made. As the security’s price changes, its average price moves up or down.

There are five popular types of moving averages: simple (also refereed so as arithmetic), exponential, triangular, variable, and weighted. Moving average can be calculated on any data series including a security’s open, high, low, close, volume or any other indicator. A moving average of another moving average is
also common. The only significant difference between the various types of moving averages is the weight assigned to the most recent data.

Simple moving averages apply equal weight to the prices. The most commonly used weights are 1 for day one, 2 for day two and so on. As per this method one has to multiply the closing prices with the weights and add the weighted closing price. Exponential and weighted averages apply more weight to recent prices. Triangular averages apply more weight to prices in the middle of the time period. Variable moving averages change the weighting based on the volatility of prices. A moving average will perform three major functions:

a. It smoothens the underlying data used for analysis
b. It will provide support and resistance points.
c. It will help in establishing a trend for the period under study.

4.4.6 Relative Strength Index (RSI)

The Relative Strength Index (RSI) is a popular oscillator used by commodity traders. Indicators constructed by applying a range are called oscillators. The name “Relative Strength Index” is slightly misleading as the RSI does not compare the relative strength of two securities, but rather the internal strength of a single security. A more appropriate name might be “Internal Strength Index”. The RSI is a fairly simple formula i.e.

\[
\text{RSI}=100-\left(100/\left[1+\frac{U}{D}\right]\right)
\]

Where \(U\) = an average of upward price change

\(D\) = an average of downward price change.
RSI can be calculated for any number of days depending upon the need of the technical analyst. In fact, it can be said that greater the time period, the lower will be the volume of wrong signals. Daily RSI is calculated by taking daily closing price, for weekly computation weekly data has to be taken and for monthly calculations data should be on a monthly basis.

4.4.7 Stochastic Oscillator

Stochastic process developed by George Lane is an important tool for taking short-term positions in the market. This technique cannot be used as an indicator which is used as an excuse to buck the trend but should be used to identify trading opportunities along the trend. The Stochastic Oscillator compares whether a security’s price closed relative to its trading range over the last X-time periods. The formula for the per cent K parameter of the Stochastic is:

\[
\frac{(\text{Today’s close}) - \left( \frac{\text{Lowest low}}{\% k \text{ period}} \right)}{(\text{Highest high} \% k \text{ periods}) - (\text{Lowest low} \% k \text{ periods})}
\]

eg.: to calculate a 20 day per cent K: First, find the security’s highest high and lowest low over the last 20 days. For this example let’s assume that during the last 20 days the highest high was 46 and the lowest low was 38, a range of 8 points. If today’s closing price was 41, per cent K would be calculated.

The stochastic oscillator always ranges between 0 percent and 100 percent. A reading of 0 percent shows that the security’s close was at the lowest price that the security had traded during the preceding x-time periods. A reading of 100 per
cent shows that the security’s close was at the highest price that the security had traded during the preceding x-time periods.

### 4.4.8 Ultimate Oscillator

Oscillators typically compare security’s (smoothed) price with its price x-periods ago. Larrey Williams notes that the value of this type of Oscillator can vary greatly depending on the number of time periods used during the calculation. Thus, he developed the Ultimate Oscillator that uses weighted sums of three Oscillators, each of which uses a different time period. The three Oscillators are based on Williams definitions of buying and selling “pressure”.

The parameters for the Oscillator are shown below. These parameters are specified at the time at which the indicator is plotted.

- **First cycle:** Enter the number of time periods in the short-term cycle
- **Second cycle:** Enter the number of time periods in the intermediate term cycle.
- **Third cycle:** Enter the number of time periods in the long-term cycle.

### 4.5 Line studies

Line studies are technical analysis tools that consist of lines drawn on top of a security’s price and/or indicator. These include support lines, those indicating resistance and the trend line concepts. The following are the major types of line studies conducted by technical analysts across the globe.
4.5.1 Trend Lines

One of the basic tenets put forth by Charles Dow in the Dow Theory is that security prices do trend. Trends are often measured and identified by “trend lines”. A trend line is a sloping line that is drawn between two or more prominent points on a chart. It is nothing but the direction of movement. There are basically three directions in which the prices can move and these three dimensions give rise to the three types of trends.

The trend is said to be a rising trend, when the prices are moving upwards. Rising trends are defined by trend line that is drawn between two or more troughs (low points) to identify price support. When prices keeps moving downwards it is said to be a falling trend. Falling trends are defined by trend lines that are drawn between two or more peaks (high points) to identify price resistance. If the prices are moving in a narrow range, the trend can be said as a flat one.

4.5.2 Speed Resistance lines

Speed Resistance Lines also called 1/3-2/3 lines and are a series of trend lines that divide a price movement into 3 equal sections. They are similar in construction and interpretation to Fibonacci Fan Lines. (explained below)

4.5.3 Raff Regression Channel

Raff Regression Channel is a statistical tool used to predict future values from past values. In the case of security prices, it is commonly used as a quantitative way to determine the underlying trend and when the prices are overextended. A Linear Regression trend line uses the least squares method to plot
a straight line through prices so as to minimize the distances between the prices and the resulting trend line.

4.5.4 Gann Studies

W.D. Gann (1878-1955) designed several unique techniques for studying price charts. The most important technique is probably the percentage retracement. Gann divided the price action into eight parts and each of this part was divided by eight to get a unique percentage. He believed that this percentage can be used to identify the tops and bottoms posted by the scrip. He was also a firm believer in the 50 percent retracement rule. As per this rule the share should have a support level at the 50 percent retracement level. This level can be computed by taking the net rise in price.

Central to all Gann’s techniques was the use of geometric angles in conjunction with time and price. Gann believed that specific geometric patterns and angles had unique characteristics that could be used to predict price action. All of Gann’s techniques require equal time and price intervals be used on the charts, so that a rise/ run of 1 x 1 will always equal a 45 degree angle. Gann believed that the ideal balance between time and price exists when prices rise or fall at a 45-degree angle relative to the time axis. This is also called a 1 x 1 angle. Prices rise at one price unit for each time unit.

4.5.5 Fibonacci studies

Leonardo Fibonacci was an important mathematician who was born in Italy around the year 1170. It is rumored that Fibonacci discovered the relationship of what are now referred to as Fibonacci numbers while studying the Great pyramid
of Giza in Egypt. Fibonacci numbers are sequence of numbers in which each successive numbers is the sum of the previous two numbers. For example: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, etc. These numbers possess an interesting interrelationship, as any given number is approximately 1.618 times the preceding number and any given number is approximately 0.618 times the following number. There are four Fibonacci studies: arcs, fans, retracements and time zones.

The general interpretations of the Fibonacci studies involve the anticipation of a change in trend as prices near the lines created by the Fibonacci studies.

4.5.6 Support and Resistance

The development of support and resistance levels is probably the most noticeable and reoccurring event on price charts. The penetration of support/resistance levels can be triggered by fundamental changes that are above or below investor expectations (e.g. changes in earning, management etc.) or by self-fulfilling prophecy. The cause is not as significant as the effect – new expectations lead to new price levels.

Support levels indicate the price at which majority of investors believe that the prices will move higher, and resistance levels indicate the price at which majority of investors feel prices will move lower. The following points explain the concept more clearly.

- A security’s price represents the fair market value.
- Change in investors expectations cause change in price of securities.
- Support levels occur when the consensus is that the price will not move lower. It is the point where buyers outnumber sellers.
Resistance levels occur when the agreement is that the price will not move higher. It is the point where the sellers outnumber buyers.

Volume is useful in determining the strength of expectations.

4.6 Chart Patterns

The foundation of technical analysis can be quoted as the charts. In technical analysis a chart is truly worth a thousand words. Chart patterns can be broadly divided into three:

- Support and Resistance
- Reversal Patterns
- Continuation Patterns
- Gaps

4.6.1 Support and Resistance

These are the turning points during any up move or down move. Support level is the price level where one can expect buying pressure to mount to an extent, whereby the fall in prices would be halted for the time being. Resistance level on the other hand would indicate the price level where the selling pressure would mount to halt the ongoing rise in the scrip.
The phenomena of support and resistance give rise to the formation of double bottom and triple bottoms and double tops and triple tops. In double bottom a share exhibits another bottom near the previous bottom after some time. If the share finds support in the third time also somewhere near the previous bottoms we have the formation of triple bottom.
If the scrip encounters resistance at a particular level (selling pressure) while the prices are moving up which makes it move downwards, that particular level is called as the resistance level. The price will bounce back when it reaches that particular level. The double tops and triple tops are stronger resistance levels.

4.6.2 Reversal Patterns

Reversal patterns are chart formations that tend to reverse the direction of the trend. These patterns can be spotted on the daily, weekly or monthly charts. For analyzing reversal patterns the most important prerequisite is the existence of a prior trend. In the market generally the signal of a trend reversal is the violation of an important trend line.

The most popular reversal pattern is the Head and Shoulder formation which usually occurs after a long gap

**Fig.4.6**

**Head and Shoulder Reversal Pattern**

*Source: Capital Market, Technical Analysis-Ideal for Beginners, Capital Market Publishers India Pvt Ltd, Mumbai, 2005, P 69*

The first hump ie the left shoulder is formed first and then the price of the scrip dips to form a downward swing. The prices then rise to post a higher top and then to another hump to post a bottom. The second higher top is termed as the head. The third top is termed as the right shoulder. For the completion of the head and shoulder pattern, it is necessary for the prices to move below the neckline.
Neckline is the trend line drawn by connecting the lower price levels of the established pattern.

Inverse head and shoulder formation is the reverse of the head and shoulder formation. It occurs at the end of the bear phase and has three distinct.

**Fig. 4.7**

**Inverse Head and Shoulder Pattern**

The major difference between the head and shoulder pattern and the inverse head and shoulder is that in the reversal pattern volume plays an important role. In the reverse pattern if prices have to show an upward trend then active buying is a must. Prices going down can be because of any of the minor reasons also, but trading up is much difficult.

**4.6.3 Continuation Patterns**

These are patterns which provide a breathing space to earlier sharp rise or fall and after the completion of these patterns the prices tend to move along the original trend.
Predictability of value or the target price is the most important advantage of this chart pattern. Among the continuation patterns, triangles are the most attractive ones. Triangle is formed with the help of two trend lines. One is the upper trend line connecting the consecutive significant tops and other trend line is drawn by connecting the consecutive significant bottoms. Minimum requirement for drawing a triangle is two bottoms and two tops. It indicates a continuation of the trend.

**Fig. 4.8**

**Triangle Formation**

![Triangle Formation](source: Kevin. S, Portfolio Management, Prentice-Hall of India Pvt Ltd, New Delhi, 2000, P 82)

Flags and Pennants are the other commonly found chart patterns. Both are continuation patterns and in general is preceded by either a sharp rise or fall in the value of the scrip. These patterns are considered to be one among the most reliable chart patterns.
Fig. 4.9

Bullish Flag

This formation looks like a parallelogram, with two trendlines sloping against the trend.


Fig. 4.10

Bearish Flag

In a bearish flag, the two trendlines would be sloping upwards.

The flag formation looks like a parallelogram with the two trend lines forming two parallel lines. Volume of trading is expected to fall during the formation of the flag and expected to pick up on breaking out from the pattern.

The pennant resembles a symmetrical triangle. (Figure 4.11). It consists of two trend lines, the upper trend lines which is falling is drawn by connecting the lower tops. The lower trend line will be rising and is drawn by connecting the rising bottoms. The normal time span for the formation of a pennant will be less than three weeks.

**Fig. 4.11**

**Pennant**


Figure 4.12 depicts a typical bullish pennent for Tata Power. It can be seen from the figure that after the formation of this chart pattern there was further increase in the share price for some time before another trend reversal.
4.6.4 Gaps

The discontinuity seen in a bar chart or any other chart patterns are termed as ‘Gap’ in technical analysis. Gap can be detected in daily, weekly and even in monthly bar charts but they are more commonly seen in daily charts. Gaps can be mainly of four types.

- Common gaps
- Breakout gaps
- Runaway gaps
- Exhaustion gaps

Common gap is observed when the prices move in a narrow range. Breakout gap mark the completion of the congestion pattern. When the prices move in a narrow range it is called as a congestion gap. The move which ensures a breakout
generally carries the prices faster and further away. Runaway gaps occur when the prices either rise or fall rapidly. Normally they occur during a straight line rise or fall. Exhaustion gaps follow the runaway gaps and they occur when the rally is getting exhausted.

4.7 **Japanese Candlestick Technique**

Japanese candlestick technique was developed by a rice future trader, Sokyu Honma. This technique is very often referred to as a leading indicator. Majority of the western indicators are called as lagging indicators as they predict the market moves after the turning point has been reached. In case of candlestick technique, it can predict the market moves before the turning point is reached.

In this technique, construction of charts are done taking care of open, high, low and closing prices of the scrip(Figure.4.13). The X-axis would represent the days and Y-axis the prices. The charts will represent the demand and supply equation of a commodity or scrip.

![Japanese Candlestick Chart](image)

*Source: Capital Market, Technical Analysis-Ideal for Beginners, Capital Market Publishers India Pvt Ltd, Mumbai, 2005, P 184*
From the above figure it can be observed that a candlestick chart has basically three parts—the upper shadow, lower shadow and the body. The upper and lower shadows are in the form of a straight line. The top of the upper shadow would represent the high prices of the day and the bottom of the lower shadow will be the lower prices of the same day. The body of the candlestick would be shaded, if the opening price is higher than the closing prices. The body will not have any shading, if it is lower than the closing price. So by looking at the shade of the body an analyst can interpret whether the day was having a bullish trend or a bearish trend.

The interpretation aspect of candlestick technique is quite interesting and there are mainly three types of chart pattern: White candle, Black Candle, Doji Candle (Figure 4.14)

**Fig. 4.14**

**Types of Candles**

![Types of Candles Diagram](source)

*Source: Capital Market, Technical Analysis-Ideal for Beginners, Capital Market Publishers India Pvt Ltd, Mumbai, 2005, P 185*
The White candle can be interpreted as closing prices for the period were higher than the opening prices. The black candle would indicate that the closing prices were lower than the opening prices. Doji candle indicates that the open and close prices are even or the can be just marginal.

4.8 Is Technical Analysis Useful?

Some academicians and professional investors doubt the practical value of technical analysis. Such skepticism arises from the lack of convincing evidence that the application of technical trading can be consistently profitable. Many blame that technical analysis fails in giving precise trading rules. They argue that even when the trading is in profitable mode, it is very difficult to ascertain whether these trading profits compensate for the risks undertaken by the trader.

In spite of all these criticisms against technical analysis, the fact is that technical analysis has cheered the development of behavioral finance over the past decade. This enthusiasm stems from the belief of the technicians that stock prices are driven by rational and irrational behavior. However, in many cases this irrational behavior is not linked to the specific price patterns identified by the technical experts. As a result, there exists a significant gap between the theory and practice.

While quantitative methods have their place in technical analysis, trader experience and judgment is the key to success. In many cases greed and fear rule the market, and in such conditions all these rules for trend line construction and pattern formation can be broken, at least temporarily. However, due to their predictive potential and the acceptance of graphical analysis by the investors, the significance of the tools used for technical analysis, has not diminished over these years.