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Additional Reading Material
on
Technical Analysis

Relevant for

1. **Module 7 (Financial Statement Analysis and Asset Valuation)**

2. **Module 18 (Securities and Derivatives Trading [Products and Analysis])**

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(This document consists of 20 pages including the cover page)

Technical Analysis

Technical analysis is the study of past market data, primarily the prices and volumes, to forecast future price movements. Using price charts, technical analysts seek to identify price patterns and market trends to trade. Some market technicians trade purely on price patterns and do not take into consideration the fundamental factors as they believe that all information is already discounted in the price. We shall begin our study of technical analysis with the price chart construction.

Charting

Charting forms the bulk of technical analysis. A chart is a record in graphic form of market information, usually taken at regular intervals – daily, weekly or monthly. Modern computer-driven graphics screens now allow charts down to five-minute intervals, or even individual trades in some cases. The patterns that emerge are compared with historical patterns that are known to have indicated a particular future trend more often than not. It is assumed that, generally, the formation of a similar pattern in the marketplace is a sign that this same trend is likely to develop.

No charting technique is foolproof and chartists work on probabilities rather than certainties. From charts which plot this behaviour, the technical analyst hopes to identify a newly developing pattern, project it to the trend which usually follows and, use this to trade in the market. The most important information used in charting in the futures markets consists of prices, volume of trading and open position, or the number of contracts that have yet to be closed by opposite transactions or by delivery. The most popular types of charts are described below.

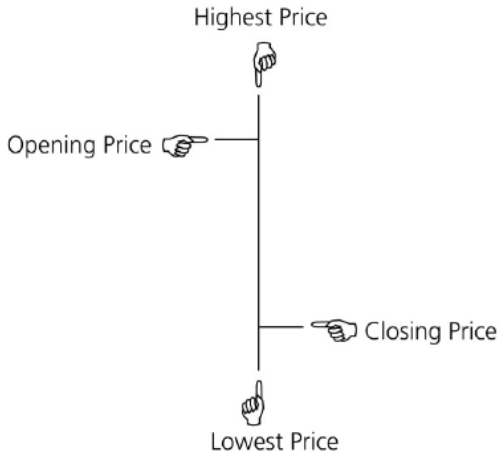
Bar charts

The bar chart is normally used by analysts who want to plot daily or weekly market moves. Price and time are shown on the axes of the bar chart. The vertical axis of the chart shows price increments and the horizontal axis shows the time period used.

Bar charts record the open, highest, lowest and closing prices for the period in question. The highest and lowest prices are plotted using the scale from the vertical axis and are joined by drawing a vertical line between the two points. For example, in drawing up a weekly chart, the chartist will record the highest and lowest prices for the week and join them by a straight vertical line. The opening price is shown by making a small horizontal mark on the left of, and the closing price by a small horizontal dash or tick on the right of, the vertical line joining the highest and lowest prices.

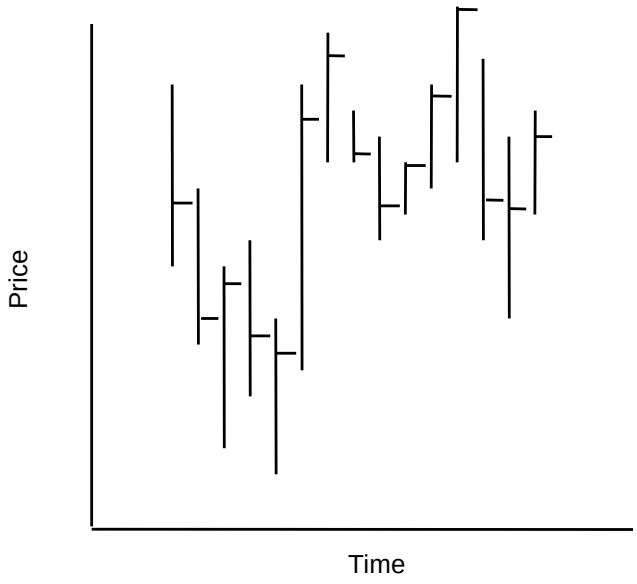
Diagram 1 illustrates how these different prices are shown.

Diagram 1: The prices shown on a bar chart



This chart provides the analyst with a clear picture of previous movements in price. Frequently, a second graph is plotted, showing the volume traded and the number of contracts still in existence (open position), at the bottom of the page. Sometimes, the market momentum is also plotted. Each period's data on price and time is recorded in a similar fashion. This is designed to aid the chartists in identifying trends and other chart patterns. Diagram 2 shows a normal bar chart.

Diagram 2: Bar chart



Interpreting bar charts

This is a brief guide to interpreting bar charts. Technical analysts themselves will often disagree on the meaning of some formations, especially when prices move rapidly, and their experience and intuition play a significant role as they form their opinions.

The most common patterns identified by analysts on a bar chart are:

- trend lines;
- reversal patterns;
- continuation patterns; and
- gaps.

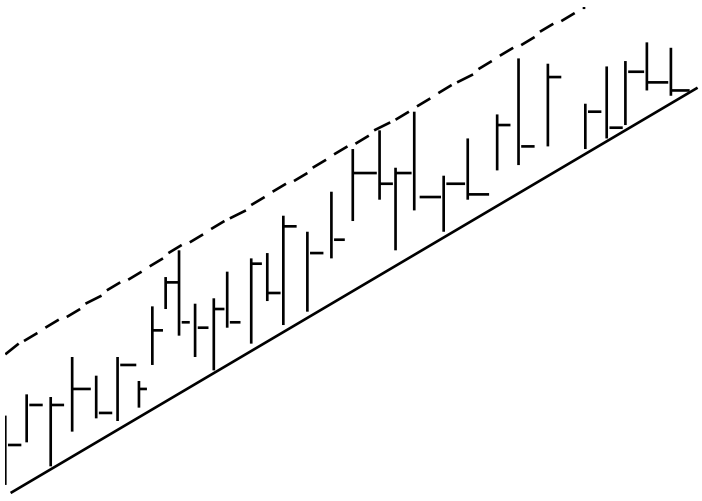
We will examine each of these briefly. One of the frequently mentioned terms on chart patterns is ***count***. A count is a way of measuring the significance of a new movement. A horizontal count is measured from the support or resistance line (these are explained further below) once a significant rise or fall in price occurs. The vertical count can be estimated on the principle that the first leg of an upward or downward move that is interrupted will continue the same distance in the second leg that was covered in the first leg.

Trend lines

The most basic pattern which emerges from a bar chart is a simple trend, indicating that prices are in an upward or downward channel.

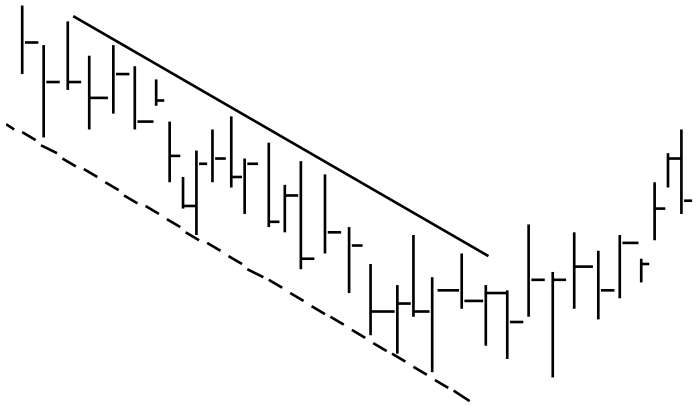
An upward trend is a succession of higher highs and higher lows, forming a closely defined straight line, often drawn in by chartists when three or more such points appear (Diagram 3). An uptrend is considered to be intact as long as prices remain above the projected trend line and the indication is to hold long or bought positions. An uptrend is usually characterised by progressively higher highs and can be said to have run its course if a new peak fails to exceed the previous one.

Diagram 3: Uptrend channel



A downtrend (Diagram 4) is defined by three or more successively lower lows in a straight line. A downtrend, which indicates holding sold positions, is said to be intact as long as prices remain below the projected trend line. A downtrend is usually characterised by progressively lower highs and lower lows, and can be said to have run its course if a new low fails to exceed the previous one. This may lead to a period of price fluctuations within a narrow horizontal range, without a definite trend, a pattern which chartists describe as a *congestion area*. If the trendline is broken by prices moving through the projected line, this may indicate the beginning of a price reversal.

Diagram 4: Downtrend channel



Uptrend and downtrend channels will help you decide when to buy and sell within the trend. It will also help you identify major trend changes, when prices break out of the channel.

Reversal patterns

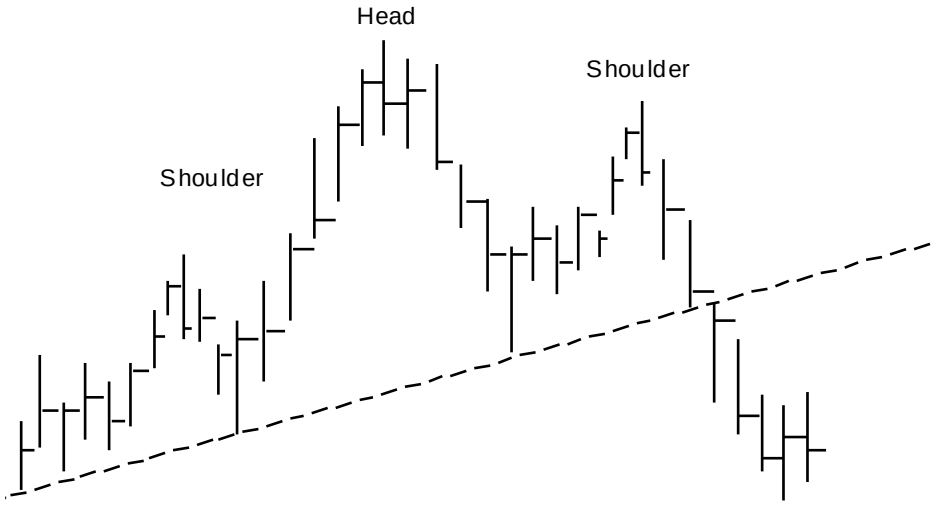
The main reversal patterns we will examine here are:

- head and shoulders;
- tops and bottoms; and
- island reversals.

Head and shoulders

The name of this pattern is highly descriptive. A head and shoulders top is formed when a market rallies, then declines, makes another rally to a higher level (the head), declines again and then moves up to a point near the first peak (forming the right shoulder) before moving into a major downtrend.

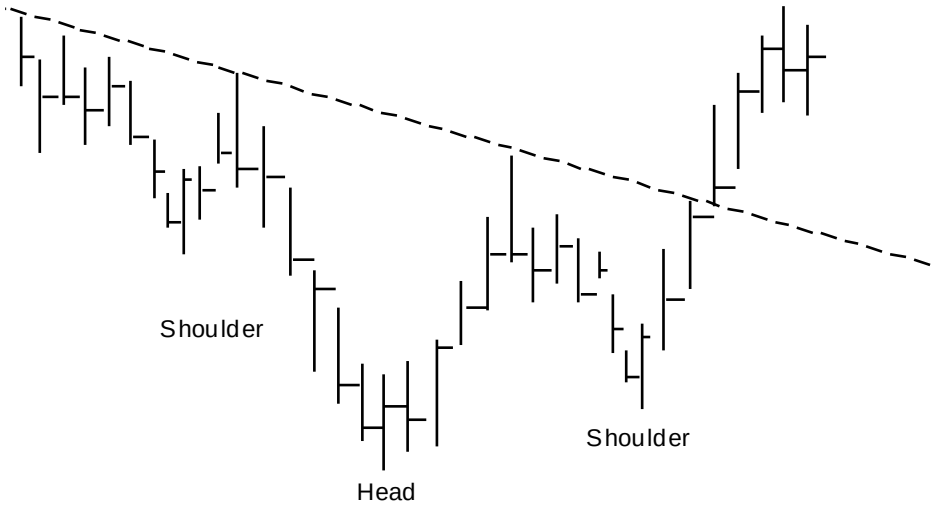
Diagram 5: Head and shoulders top



A neckline is formed by drawing a line connecting the troughs between the two shoulders, and considerably lower prices are indicated when the market falls from the right shoulder to penetrate the neckline (Diagram 5). If the rally forming the right shoulder does not carry as far as that forming the left, a particularly steep price reversal is indicated.

The inverse of this formation is the head and shoulders bottom (Diagram 6) which carries the reverse implications.

Diagram 6: Head and shoulders bottom

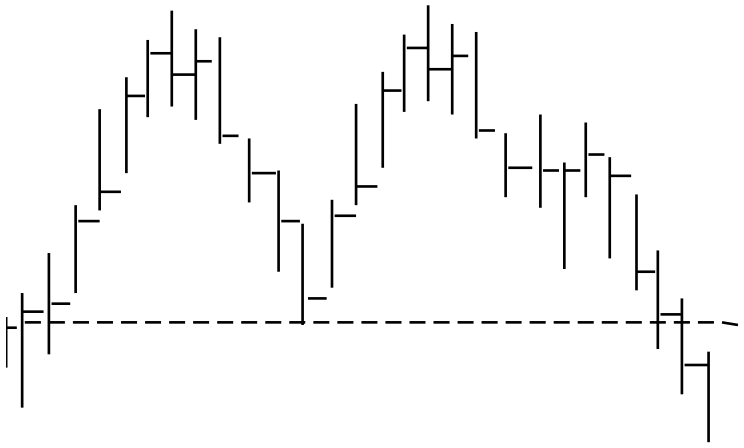


Tops and bottoms

Naturally enough, a major preoccupation of chartists is to identify peaks and troughs in price movement, since these are classic sell and buy signals respectively. In the chartist's language, the peaks are tops or areas where selling pressure begins to drive prices down after an increase, while the troughs are bottoms and represent areas where buying pressure reasserts itself after a decline, pushing prices up.

A double top and bottom describes the chart formation which occurs when two successive highs or lows reach approximately the same point (usually within a few percent of each other). A double top (Diagram 7) is not considered to have formed until the fall from the second peak moves down past the trough between the two tops. It is then thought to be a definite sell signal. A double bottom is the inverse of this formation.

Diagram 7: Double top



Island reversals

Island reversals are strong indicators in the 'topping process' and are, as their name suggests, reversal patterns. The island reversal pattern usually indicates an area where the "last" buyers are entering the market. This is usually referred to as the area where the "man in the street" and "taxi drivers" are talking about entering the market. Market gaps higher on open, leaving the gap unfilled. No follow through buying occurs and the smart money has exited or is exiting the market. The next day (sometimes two or three days later), the market gaps down, leaving the gap unfilled. Diagram 8 shows a typical island reversal.

Diagram 8: An island reversal

Continuation patterns

Continuation patterns include:

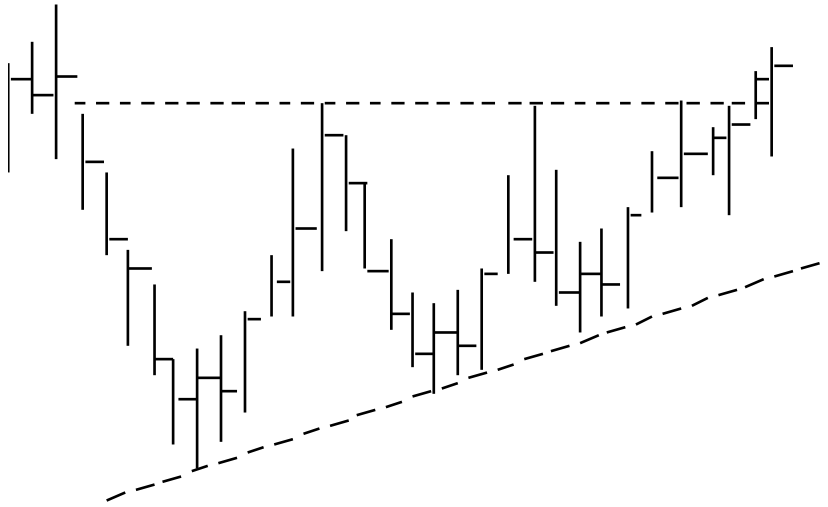
- triangles;
- flags and pennants; and
- gaps.

Triangles

Triangles are another common charting pattern. They can be symmetrical, ascending or descending. All three types of triangle are normally formed during a period of declining volume and need to "break out" before progressing two thirds of the way to the apex in order to be reliable.

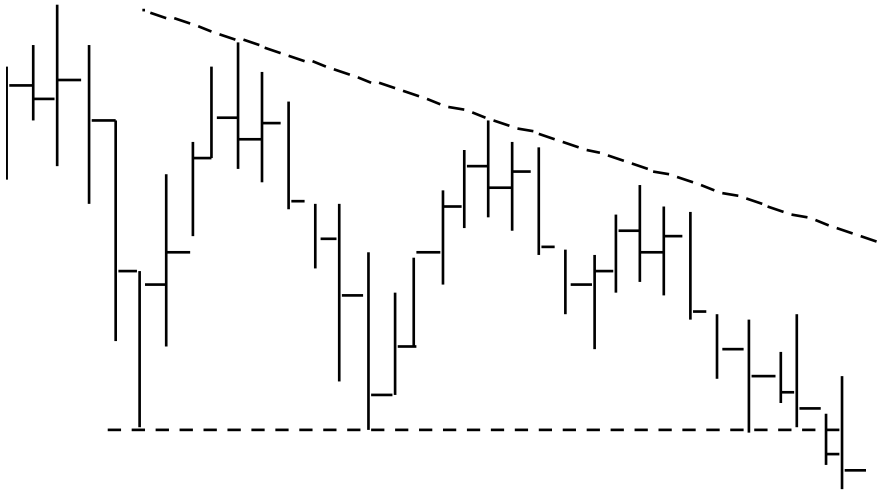
Ascending triangles are formed when, in an uptrend, prices show successively higher lows but consistently meet selling pressure at a single price. This is an indication that the upward trend will continue, following a break through the resistance level (the top line of the triangle) (Diagram 9). Thus, the ascending triangle reflects weakening sellers and stronger buyers as prices move sideways and create the flat topped triangle with the 'ascending' bottom. This is a bullish formation and once the horizontal resistance line is decisively broken, you can expect a move approximately equal to the height of the triangle, measured for the horizontal line.

Diagram 9: Ascending triangle



In a descending triangle, prices meet buying support at a particular price level and register successively lower highs (Diagram 10). The indication is a continued downtrend after the support level is broken. (Small intraday triangles seem to be less reliable than larger ones). These triangles clearly indicate which way prices are going by their flat bottoms and downward sloping tops. The descending triangle is a bearish formation, featuring lower and lower highs as prices move sideways and the buyers become less enthusiastic. Once the horizontal support line is decisively broken, you can expect a move approximately equal to the height of the triangle.

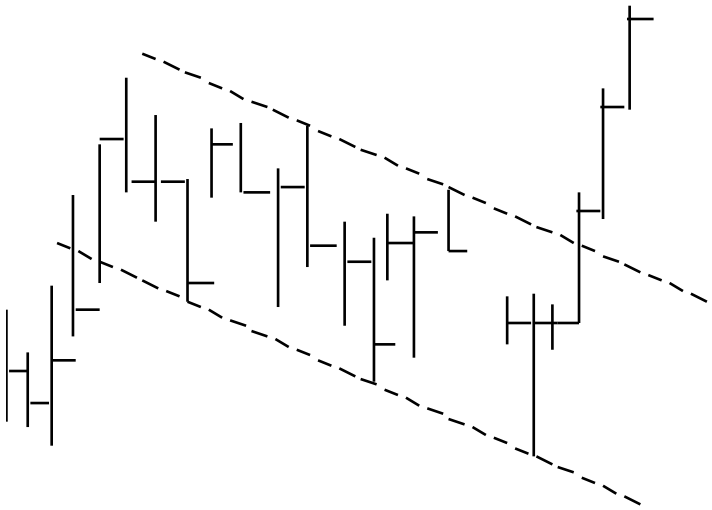
Diagram 10: Descending triangle



Flags and pennants

Flags are small parallelograms and pennants small triangle formations which form after rapid upward or downward moves in the market (Diagram 11). Said to be among the most dependable of bar chart patterns, they are usually associated with a decrease in volume as the market undergoes a quiet consolidation before continuing its run. Some analysts go as far as to consider the flag or pennant as marking the half-way point of a trend.

Diagram 11: Flag



The flag is a continuation pattern which may occur many times within a single trend. It features parallel sides and slopes upward within a downtrend and downward within an uptrend. It is generally a very reliable pattern and reflects a period where a market takes a brief pause in an established trend and prepares to continue after a short break.

Gaps

Gaps are points at which no trading takes place, for instance, when a market opens at a higher point than it had reached the previous day and continues upwards. (Put simply, no actual trades take place but "bids" and "offers" are higher than they were on the previous day). The three types to note are as follows:

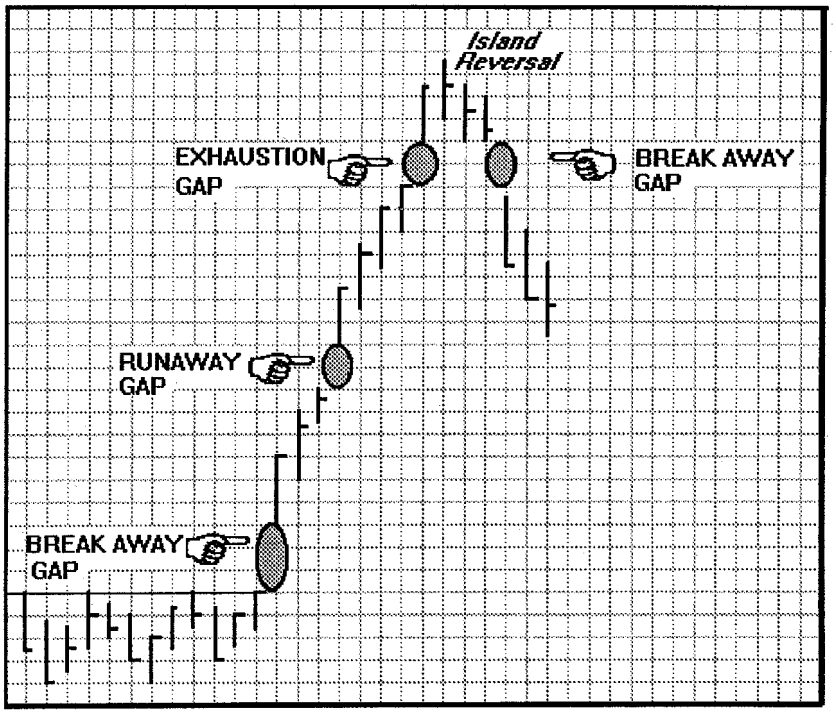
Breakaway gaps**:** These occur as prices make a sudden move out of a congestion area (gaps within congestion areas are not considered significant)

Runaway gaps**:** These occur within an already established trend, as the market jumps over several points of price movement from one trade to the next in the direction of the trend

Exhaustion gaps**:** Said to mark the end of a major price move, exhaustion gaps are easily confused with runaway gaps, the only difference from the chartists' point of view being that the exhaustion gap is followed by a sharp reversal, and thus can only be easily identified in retrospect. Chartists use

supplementary information, such as opening prices, to distinguish the two. An exhaustion gap may be suspected when a wide gap appears, followed by a lack of direction in the market on strong volume.

Diagram 12: Gaps



It has been reasoned that, as a general rule, a market surge strong enough to enable prices to jump several points between trades must be indicative of a trend with considerable energy. Like flags and pennants, gaps often signal the continuation of the existing trend.

Support and resistance areas

The market moves higher or lower in a series of peaks and troughs, otherwise known as ***supports*** **or** ***resistances*****.**

Trough or reaction lows are called ***supports***. They indicate a level or area (on the chart) under the market where buying interest is sufficiently strong to overcome selling pressure, or at least halt a decline temporarily, usually a previous low. ***Resistance*** is the opposite of support, and represents a level or area over a market where selling pressure may overcome buying pressure and a price advance may be turned back, often a previous peak. Trend lines and moving averages are also treated as supports and resistances.

Failure to exceed a previous peak in an uptrend, or the inability of prices to violate the previous support low in a downtrend, is usually the first warning that the existing trend is changing.

Whenever a support or resistance level is penetrated by a substantial amount, they reverse their roles, i.e. the market rally, having stalled at a previous peak, has now surged above, any pullbacks from these higher levels are expected to find support at a previous peak. Resistance has now become support.

If a decline has broken below a previous low by a substantial amount, any bounces in price will expect to find resistance at an old low. Support once broken, becomes resistance.

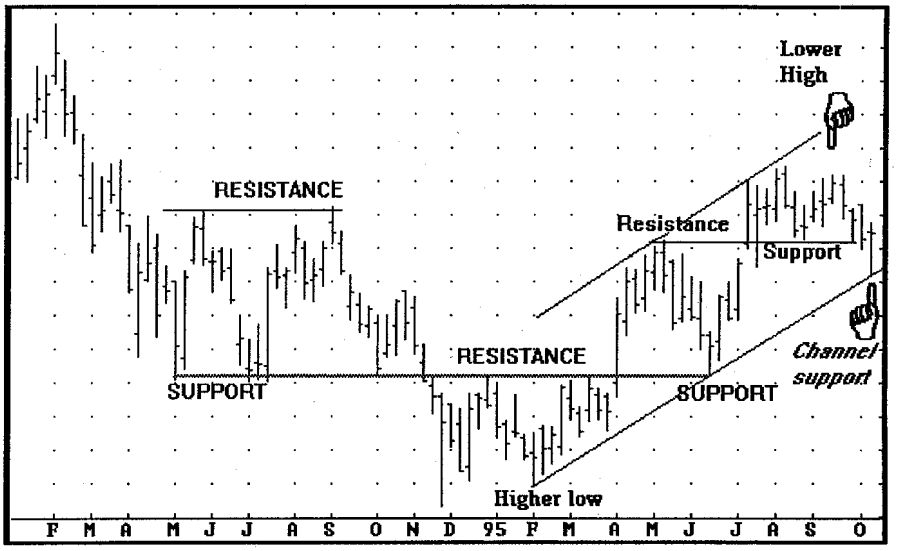
Three things need to be considered when determining the strength of support and resistance areas:

- The amount of time spent at the support or resistance area – the longer, the more significant;
- The volume and number of contracts that changed hands at support and resistance areas; and
- How recently the trading took place, such as dealing with the reaction of traders to market movement and to positions that they have already taken or failed to take.

Resistance and support areas often formed around even numbers for a price, as traders are often unwilling to allow an easy break through this "psychological barrier". The USD1800 an ounce mark for gold is a good example – at this price, an upward trend usually meets resistance, while a downward trend often meets support.

Diagram 13 shows a number of support and resistance areas on a bar chart.

Diagram 13: Support and resistance chart



Volume and open position

It is a rare analyst who neglects to take volume and open position into account when interpreting his charts, since they provide valuable information about developing trends. Volume is simply a measure of the number of contracts traded in any one period, while the open position is the total of buy or sell commitments outstanding in the market. The following general rules have been extrapolated from experience.

The market can be considered technically strong if:

- prices rise and both volume and open position increase. In this case, rising prices combined with high volume indicate strong buying in the market. The increase in open positions indicates that this is new buying, rather than the closing-out of existing sold positions. The buyers, therefore, expect further rises; and

- prices fall and both volume and open positions decrease. Here, the price fall and the low volume suggest a small amount of selling, while the lower open position indicates that most of the selling consisted of closing-out of previously bought positions. The sellers, therefore, were probably discouraged holders of long (bought) positions closing-out at a loss, leaving the market technically stronger.

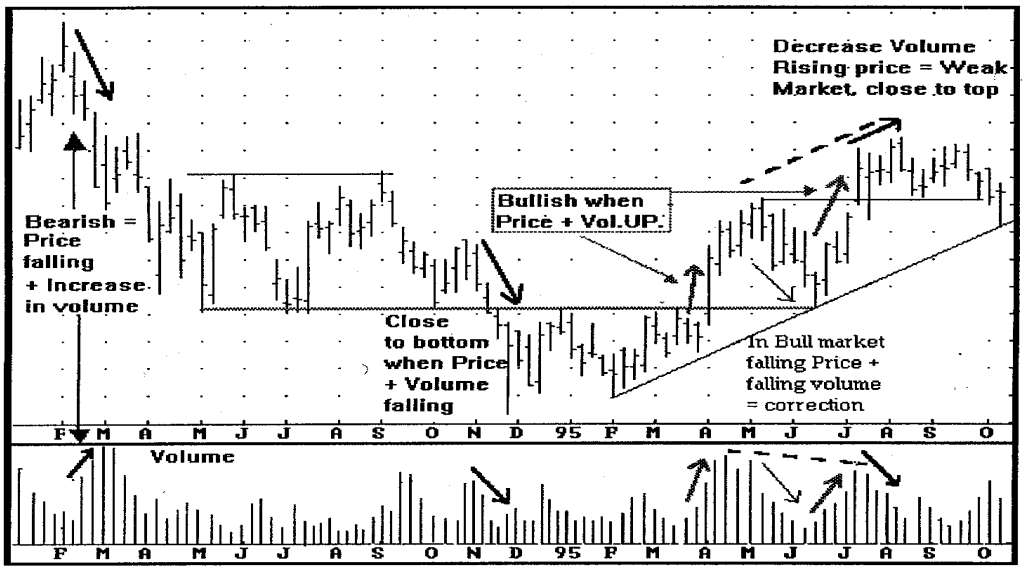
The market can be considered technically weak if:

- prices fall and volume and open positions increase. This situation indicates a large amount of selling, most of which must be fresh selling rather than closing-out of bought positions. Sellers therefore expect a further decline; and

- prices rise but volume and open positions decrease. This combination suggests a small amount of buying, with the decrease in open interest indicating that the buying was fuelled by closing-out of previously sold positions. In other words, short sellers have bought back in order to stop their losses.

Volume alone can also be important in confirming a trend. For instance, it has been noticed that a sharp increase in volume often takes place towards the end of a rally and near the bottom of a decline in prices. A true trend is accompanied by higher volume when the market is moving in the direction of the trend and then with lower volume as the market makes corrections away from the trend.

Diagram 14: Volume chart



It should be noted that seasonal factors often influence changes in volume and open interest, which will both increase as those with genuine risks in the physical market place their hedges. Volume will increase and open positions will decline as the hedges are lifted. This is especially true for commodities such as wheat, which are particularly sensitive to seasonal factors, and the best analysts make corrections for such influences before drawing conclusions from figures on volume and open positions.

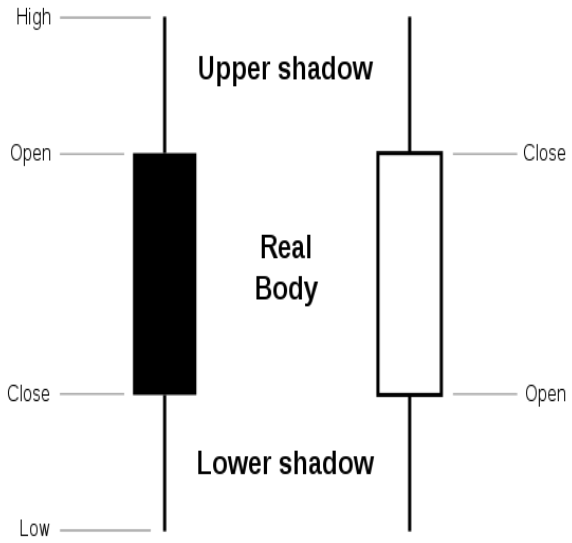
No serious research has confirmed the validity of such inferences as are drawn above from generalisations about volume and open positions. Used in conjunction with other information, however, they can correct mistaken impressions that might be obtained from a less informed interpretation of chart patterns.

Candlestick chart

Candlestick chart is a popular version of the bar chart. The only difference is that the area between the opening price and the closing price of each bar ***is shaded if the close is below the open*** or ***left blank if the close is above the open.***

Diagram 15 below illustrates the basic candlestick.

Diagram 15: A basic candlestick

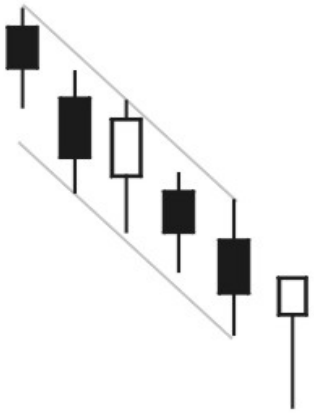


The candlestick chart is constructed by plotting each candlestick consecutively over time.

Diagram 16 illustrates a candlestick chart

Diagram 16: Candlestick chart

Price



Time

Indicators

Moving average charts

The moving average is one of the most versatile and widely used of all technical indicators.

A moving average is the average of successive daily closing prices over a predetermined number of days, plotted continuously. This is usually referred to as a *simple moving average*. Suppose a market closed at 90 sen, 100 sen and 110 sen on three successive days. To construct a three-day moving average, the first plotted point would be at the average of these three prices, or 100 sen. If on the following day the price moved to 120 sen, the moving average's next plotted point would be at 110 sen, again the average closing price over the past three days. A line would be drawn from 100 sen to 110 sen on the chart to show the upward trend. Supposing that on the next day, the price fell to 106 sen, the next plotted point would be 112 sen, or the average of 110 sen, 120 sen and 106 sen.

Note that although the market has moved down 14 sen, the moving average was still rising on this day, from 110 sen to 112 sen, illustrating the characteristic lag of the moving average behind the market trend. A further fall the next day to 101 sen would bring the moving average back to 109 sen, confirming the market's downward trend.

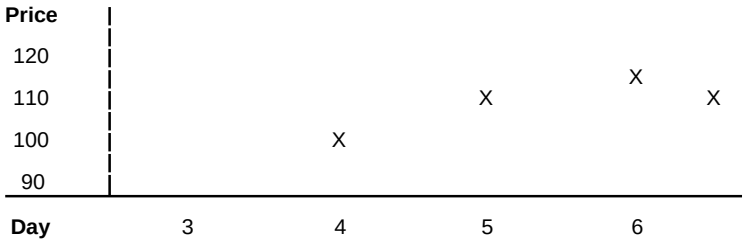
Table 2: Moving averages

Day	Price	Three-day moving average
2	90	
3	100	
4	110	100
5	120	110
6	106	112
7	101	109

The aim of the moving average chart is to filter out day-to-day *noise* to reveal the underlying trend.

If the market has been trending down, the moving average will tend to track it as it falls, remaining just above the latest price. If a new price suddenly penetrates up through the moving average line, this is considered a buy signal. Similarly, if after an upward trend the market closes below the moving average, this is a sign of an imminent price drop.

Diagram 17: Moving averages



Moving averages are a trend-following indicator, thus they are more profitable when the market is trending strongly, either up or down, as opposed to sideways in choppy ranges or patterns, which usually generate several false buy and sell signals.

Types of moving averages

There are different types of moving averages, including the following:

- Double moving average**:** The period of the moving average is critical: moving averages can be calculated over short periods, typically five days, or long periods, typically up to 40 or 60 days. A short-period moving average is very sensitive and may give false signals, if the market makes a short-term correction. On the other hand, long-period moving averages often provide late signals, meaning profits are missed. For this reason, chartists often use two moving averages of different periods in tandem. The double moving average provides a buy signal when the shorter average crosses above the longer. Alternatively, a chartist may decide a buy signal is only valid when the market moves up to close above both the short-term and the long-term moving averages

- Linearly weighted moving average**:** This is a moving average that gives more weight to the most recent prices. For a 10-day moving average, the price on the 10th day is multiplied by 10, the price on the ninth day by nine, and so on. The total is then divided by the sum of the multipliers (55 for a 10-day average, equal to 10 + 9 + 8 + ... + 1)

- Exponential moving average**:** This moving average assigns greater weight to recent price action and diminished importance to past price action. All price data in the futures contract is included. This formula requires a computer. It is similar to the linearly weighted moving average and tends to track the price movement more closely than a simple moving average.

Interpreting moving average charts

Moving average charts are most commonly used as a complement to the bar chart but may be used alone to confirm an apparent price reversal in the market.

A long or bought position, for example, is held as long as the moving average shows an upward trend, while a short or sold position will not be closed-out until the moving average turns up out of a downtrend. The disadvantage that the reversal is not confirmed until

sometime after it has actually occurred in the market, is offset by the advantage that the chart is, therefore, less likely to give a false signal and more likely to indicate a true trend.

Some chartists use a moving average line plotted with a lead of approximately half the average period in an effort to overcome the disadvantages caused by the moving average chart's lag behind the trend. The chartist will then consider it significant if the daily closing price line crosses the moving average line. If daily closes move down through the moving average, this will be a signal to liquidate long positions. When confirmation of the trend is given by a turning down of the moving average, new short positions may be taken.

Alternatively, buy and sell signals can be generated by a short moving average crossing a longer one in an upward or downward direction.

In all of these systems, a shorter moving average responds more quickly but gives more false signals, while a longer moving average gives fewer false signals but is slower to respond. The trade-off requires experience in the market and flexibility when its behaviour changes.

Relative strength index (RSI)

The relative strength index (RSI) is a momentum oscillator that measures the speed and change of price movements of an underlying asset or security. This indicator was developed by J. Welles Wilder and is widely used by market participants to gauge whether a tradable instrument is over-sold or over-bought and is ripe for a reversal of prices. Wilder himself recommends the use of 14-day RSI as the primary indicator but in recent times, the 9-day and 21-day RSI is also widely used.

Calculation

RSI = 100 – (100/(1+RS))

Where RS = Average gain over N-periods/Average Loss over N-periods

To obtain the RSI, we need to follow a few steps. We will use the table below

Step 1: Calculate the gains or losses of your underlying instrument. We will use the absolute values for all the losses and gains.

Step 2: Calculate the average gains and average losses over the stipulated period which in this case, is 14 days. This is a ***rolling calculation*** in the sense that we are calculating the average gain for the past N-days (14 in this case) and average loss for the past N-day.

Step 3: Obtain the RS term which is the dividing average gain by the average loss.

Step 4: Obtain the RSI by using the formula. This will normalize the value so that it will always be between 0 and 100.

Step 5: Plot the RSI values to obtain an RSI chart.

RSI calculation example:

Day	Closing Price	Change	Gain	Loss	Avg. Gain	Avg. Loss	RS	14 day RSI
1.00	5.23							
2.00	5.28	0.05	0.05					
3.00	5.33	0.05	0.05					
4.00	5.30	-0.03		0.03				
5.00	5.40	0.10	0.10					
6.00	5.43	0.03	0.03					
7.00	5.44	0.01	0.01					
8.00	5.48	0.04	0.04					
9.00	5.43	-0.05		0.05				
10.00	5.40	-0.03		0.03				
11.00	5.45	0.05	0.05					
12.00	5.50	0.05	0.05					
13.00	5.53	0.03	0.03					
14.00	5.60	0.07	0.07					
15.00	5.56	-0.04		0.04	0.03	0.01	3.20	**76.19**
16.00	5.70	0.14	0.14		0.03	0.01	2.87	**74.14**
17.00	5.66	-0.04		0.04	0.04	0.01	2.74	**73.24**
18.00	5.68	0.02	0.02		0.04	0.01	3.25	**76.47**
19.00	5.75	0.07	0.07		0.03	0.01	2.75	**73.33**
20.00	5.77	0.02	0.02		0.03	0.01	3.00	**75.00**

Overbought and oversold

Wilder considers RSI levels above 70 to indicate the underlying instrument is over-bought and levels below 30 to indicate that it is over-sold. These extreme conditions are warnings to the chart user to expect a possible reversal (at least short term) of the trend and for the price of the underlying instrument to move in the other direction. See the diagram on the next page for a typical RSI chart with the designated over-bought and over-sold levels.

It is important to note that in very strong trends, RSI may continue to show over-bought or over-sold conditions for long periods of time and merely relying on the RSI as a basis for a trade can be limiting. The RSI should be used with other technical indicators to help the trader or portfolio manager to arrive at an assessment of the technical picture of the underlying instrument.

Diagram 18: A typical RSI chart