

Research & Product Development

Technical Analysis Primer

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Technical analysis covers an extremely broad spectrum of concepts and techniques. Many technical methods are quite complex, relying on reams of statistical information. Other technical methods may be simple and are based on rather simple visual interpretation of a price chart.

One thing which is clear is that technical analysis is in commonplace usage in financial markets, prominently including futures markets. In fact, it is not an exaggeration to suggest that technical forecasting methods may be more widely followed and form the basis for more trading activity in the context of futures markets than any fundamental indicators.

This is evident when you consider that there are thousands of commodity trading advisors (CTAs) and macro hedge funds offering their funds management services largely on the strength of their technical market forecasting expertise. Many of these traders are using the most modern computerized trading technologies to program mechanical or automated trading systems, sometimes under the banner of “algorithmic trading methods. In any event, the market frequently is driven by these technical factors. Accordingly, we suggest that astute traders cannot afford not to pay attention to these interesting and potentially quite rewarding technical forecasting methods.

Why Technical Analysis?

Technical forecasting techniques have been in use, in one form or another, at least as long as organized markets have been in existence. But technical methods are not the only means by which one may attempt to gain an insight into potential future market movements. This section attempts to answer the question "why should I be interested in technical analysis?" by discussing the distinction between a technical and

Technical analysis covers many methodologies from chart interpretation to statistical methods. And these methodologies have found widespread application in the futures markets, practiced by large institutional and small retail traders alike.

fundamental approach to market forecasting as well as a bit about some of the origins of technical trading methods.

Fundamental and Technical Analysis - Technical and fundamental analysts have often been at odds regarding the validity and relevance of the two approaches to market forecasting. Let's discuss the role that each method may play in a trading situation and why technical analysis plays so prominent a role in many futures trading applications.

Fundamental analysis, or the study of the basic conditions of supply and demand that impact a particular commodity, is not at odds with technical analysis.

Fundamental analysts are most concerned with the question 'why?' Why does the market move the way it does? What fundamental economic conditions may cause the market to fluctuate upwards or downwards? *I.e.*, fundamental analysts busy themselves studying cause and effect relationships.

Fundamental traders study cause and effect relationships. Technicians believe that all known technical information is already incorporated in the marketplace and that new technical information is reflected almost immediately. Thus, trading on known fundamental information may be difficult.

Technical analysts believe that the market price already incorporates all known fundamental information. As new economic data is released, it is incorporated into the market price level efficiently and almost instantaneously. Therefore, it becomes difficult to trade profitably on the strength or weakness of known fundamental information. Thus, you should focus on a study of the price level and patterns in price movements directly!

The market trades, from day to day on the strength or weakness of unknown fundamental factors. More specifically, on the strength or weakness of what traders believe these factors will portend as they become known. More than anything else, therefore, the market trades on the basis of market psychology or the bullish or bearish attitudes of market participants in the aggregate.

Between the times that significant fundamental information becomes known, the market fluctuations based on trader psychology. Technical analysis is essentially a study of psychology and market perception.

Many academics question the validity of technical trading methods. In fact, these same academics frequently warmly embrace the so-called "random walk" theory. The random walk theory suggests that market prices respond as fundamental market information is made known quickly, efficiently and without serial autocorrelation. The absence of serial autocorrelation in a price series or more specifically, in a series of price movements, is said to occur because today's fundamental economic release may bear little correlation to tomorrow's fundamental economic release. Random walk theorists believe, therefore, that market prices fluctuate unpredictably and randomly over time.

But this is not inconsistent with the technical viewpoint that the market may fluctuate considerably between the points in time at which fundamental information is made known. During those intervals, market perceptions become more important than the most recently issued bit of fundamental market news.

Random walk theorists may assert that market movements are random and unpredictable. But a simple inspection of any chart book will probably satisfy most observers that the market tends to move in trends. Not only does the market tend to move in trends, but pricing patterns tend to repeat themselves and are witnessed over and over again. There are very few if any traders, for example, who have never seen a so-called "head and shoulders" formation. And very few who are unfamiliar with the traditional interpretation and pricing implications of the pattern.

If the market trends and behaves in accordance with repeating patterns then traders will take action accordingly. If many traders rely on similar technical systems (and there is evidence to suggest that most trend following systems will trigger buy or sell recommendations in rough unison), then technical analysis becomes a kind of "self-fulfilling prophecy." If you believe the market will advance or decline and buy or sell accordingly, then the market may very well tend to rise or fall. This may be particularly true if there are a large number of like-minded traders.

Many of the "principles" of technical analysis are quite unusual and might even seem to lack a common sensical basis. But if enough traders believe that a given technique will work, it may very well work. If technical analysis is useful at all, therefore, it is because traders believe it will provide useful information. Their subsequent actions enforce those predictions. This implies that one should only be concerned about methods which fall in the mainstream of technical thought. Other, more arcane methods cannot work because too few traders will utilize those methods and, therefore, enforce their predictions.

Technical Analysis and the Futures Markets - Most of the technical work which has been done throughout the years has centered on the stock markets. In particular, famous analysts such as Dow and Elliot concentrated exclusively on equity markets. Nonetheless, a case may be made that technical analysis is more relevant in the context of the futures markets than in any other segment of the marketplace.

This is due largely to the fact that futures trade on low margin or performance bond requirements relative to the value of the underlying instrument. It is not uncommon for the margin on a futures contract to be anywhere between 1-5% of the total value of the delivery instrument. Compare that to the minimum 50% margin requirement associated with stocks. As such, futures traders enjoy extreme leverage compared to equity traders. But these comparisons do not tell the entire story.

When you buy stock, that 50% minimum margin requirement represents a down payment on the purchase price of the stock. The balance is typically

Despite academic theories such as the "random walk," markets frequently trend over extended periods of time. And if the market trends or periodically behaves in certain patterns, traders will take notice and act.

Thus, technical analysis may work to the extent it becomes a "self-fulfilling prophecy" of sorts.

borrowed at interest from the broker. This is appropriate because when you purchase stock, you acquire an equity interest in the issuing firm.

Because of the high leverage typically offered by futures contracts, they tend to be used as short-term, high-velocity trading vehicles more so than long-term buy-and-hold investment vehicles.

But when you buy (or sell) futures, the difference between the value of the commodity and the margin or the "unpaid balance" is not lent at interest. This is because the margin associated with futures transactions serves an entirely different purpose than a stock margin. A futures margin simply represents a "good faith deposit" or "performance bond." It is intended to secure the integrity of the contract by covering the risk associated with a single day's price movement. The margin need only cover a single day's maximum possible risk because margins are administered daily. *I.e.*, there are no paper profits or losses because traders "mark-to-market" daily. Profits or losses are distributed or paid daily and in cash.

Thus, one generally can not afford to be wrong in the short-term and right in the long-term in the futures markets. To the extent that technical analysis typically is used for shorter-term trading purposes, it may have more relevance for futures traders than for traders in the underlying cash or spot markets.

But the initial margin is deposited in the form of collateral and this collateral is often accepted in the form of securities, generally T-bills, on which the futures trader continues to earn the interest. Thus, there is no explicit opportunity cost associated with the initial purchase or sale of futures. Thus, futures traders enjoy 100% leverage. Because of this extreme leverage, futures traders generally cannot afford the luxury of a "buy and hold" strategy. Equity traders may buy a stock and hold it in the face of adverse market movements because they know that they have already paid the full purchase price. But futures traders may not be able to fund variation cash payments associated with a losing futures position.

Futures trading, therefore, is much more of a short-term proposition. Because futures positions are not likely to be held for an extended period of time, timing is paramount! A futures trader who is right in the long-term but wrong in the short-term loses money. Futures traders who are wrong in the long-term, but right in the short-term, usually make money. The "trick" is to be right in the short-term.

This means that technical analysis may be much more important than fundamental analysis in the futures markets. Fundamental analysis may provide useful insights in the long-term. But often short-term market trends run contrary to long-term trends. Technical analysis is a tool which is much more useful in the short-term.

Dow Theory - If any single individual may be credited with the introduction of modern technical thought, it is probably Charles Dow. Dow was an owner and editor of the Wall Street Journal in its early formative years. Dow's "Theory" appeared in a series of editorials carried by the paper in the late 1800s until Dow's death in 1904. Some people may question the relevance of Dow's ideas in an age of advanced telecommunications, computerized trading methods and extremely fast

paced markets. Yet, much of his work endures today and has heavily influenced vastly disparate schools of financial thought.

Among Dow's achievements was the introduction of a series of stock market indexes, one of which became known as the Dow Jones Industrial Average (DJIA). The first of Dow's stock averages, published initially on July 3, 1884, was an eleven stock rail average. In 1885, that average was expanded to include twelve rail stocks and two industrials. By 1896, the composition of the average was altered such that it contained exclusively industrial stocks. Finally, by October 7, 1896, Dow created two averages: a twelve stock industrial and a twenty stock rail index.

Dow relied heavily upon these indexes for technical forecasting purposes. In particular, Dow believed that it was more worthwhile to study the movement of the indexes rather than movement in any individual stock. Dow believed that the price of any individual stock may be affected heavily by unique factors which may not impact upon other firms. In order to identify broad market trends, therefore, it was important to focus on the averages. Further, Dow believed that bullish movement in either the rail or industrial average should be confirmed by similar action in the other index.

Although Dow is not generally credited with the idea, it is clear that he recognized that the risks associated with any individual stock were a function of general economic conditions as well as conditions which might uniquely impact upon a given stock. *I.e.*, Dow recognized early on what has become an axiom in modern financial thought: the total risk associated with any given stock is comprised of "systematic" and "unsystematic" market risks. Systematic risks refer to those general economic factors which impact upon all stocks to one degree or another. Unsystematic risks may uniquely affect a given firm with little or no impact upon other firms.

These ideas represent a cornerstone of the "capital asset pricing model" (CAPM). The CAPM was hammered out largely in the 1950s and early 1960s by a variety of academics who might have little sympathy for many of Dow's theories. Nonetheless, they owe a large debt of gratitude to Dow. In particular, it is interesting to note that systematic market risks are today measured by stock market averages or indexes such as the Dow Jones Industrial Average (DJIA) or the Standard & Poor's 500 (S&P 500).

Not only did Dow's thought feed into the CAPM, his work also deeply affected other financial theorists of a quite different ilk. Ralph Nelson Elliot, a leading technician of the 1930s whose theories known cumulatively as "Elliot Wave Theory" are in common usage today, was an ardent student of Dow Theory.

Charles Dow is widely credited for his pioneering work in technical analysis as well as the original owner and editor of the Wall Street Journal.

Charles Dow pioneered the development of stock indexes with the introduction of what became the Dow Jones Industrial Average dating to 1884.

Dow relied on these indexes for purposes of technical analysis, recognizing the all stocks respond, to one degree or another, to the same set of general economic conditions.

Charles Dow categorized trends as (1) primary, (2) secondary, (3) minor, by reference to the length of time spent in the trend.

Dow believed that market movements may be categorized as (1) minor, (2) secondary; or (3) primary trends. A minor or "near-term" trend may broadly be considered as movement which lasts anywhere from 2-3 days to 2-3 weeks. A secondary or "intermediate-term" trend may last from 2-3 weeks to 2-3 months. A primary, major or "long-term" trend may last upwards from 2-3 months.

(In today's world of futures trading, characterized by high-velocity electronic trading techniques, our horizons may be shortened a bit relative to Dow's world of a hundred years ago. Thus, we might trade futures on an intra-day basis; "swing" trades may be characterized as those lasting from a day or two or three upwards to two to three weeks. Beyond that, long-term futures trades may be held for two to three weeks and beyond.)

Ralph Nelson Elliot ran with Dow's ideas about identifying trends, creating an elaborating structure and body of work analyzing these issues.

Elliot believed that he refined these ideas considerably. In particular, Elliot was far more specific in identifying various trends. In addition to the primary, secondary and minor trend, Elliot refers to trends of smaller duration - the minute, minuet and sub-minuet. Further, Elliot has identified trends of larger degree in the cycle, super-cycle and grand supercycle, which may last upwards to 200 years!

Dow suggested that a trend breaks down into the accumulation, technical trend-following and distribution stages.

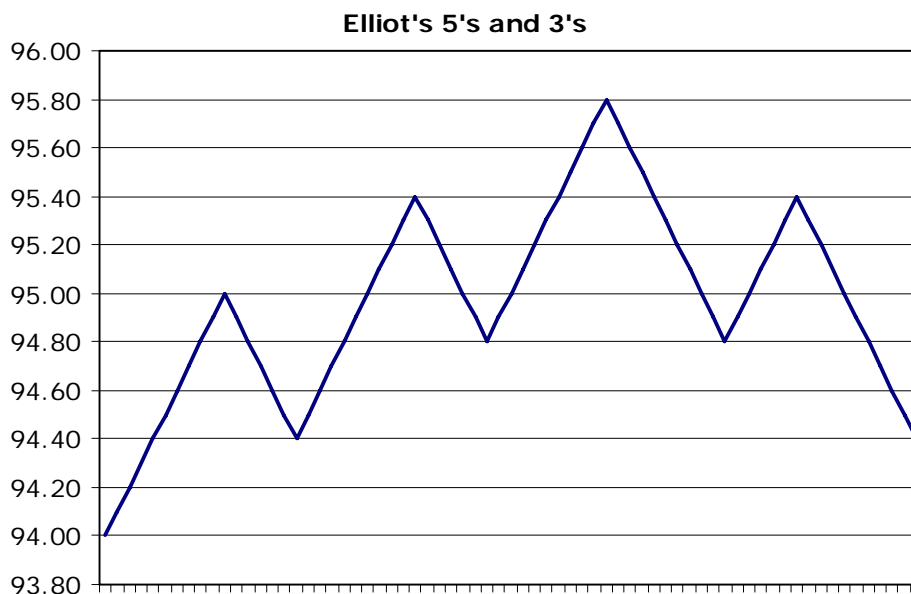
Dow also suggested that a primary trend breaks down into three stages: (1) the accumulation stage; (2) the technical trend-following stage; and (3) the distribution stage. Let's consider a primary bull trend. The accumulation stage represents the initial stage of a primary market movement. This is where the "smart money" begins to take a position by buying the bull trend. The technical trend following stage occurs later when a variety of technical trading systems confirm the existence of a trending market and trigger buys. The distribution stage is the final upward surge where the "smart money" begins to take its profits.

Elliot looked for waves of 5 and 3 movements or surges with or against the prevailing trend.

Elliot wave theory is based primarily upon the idea that the market moves in distinguishable patterns. In particular, the market may rally in a bull market in a five step pattern and subsequently correct itself in a three step pattern. These "5s" and "3s" represent the core of the Elliot wave theory.

The five step upward movement is denoted with the numbers 1, 2, 3, 4 and 5. The subsequent corrective phase is denoted with the letters a, b and c. Hence, these 5s and 3s may be referred to as the "numbered" and the subsequent corrective "lettered" phases. The numbered phase breaks down into three "impulse waves," specifically waves 1, 3 and 5 in the general direction of the market trend. The intervening waves 2 and 4 represent "corrective waves." The point is that these three impulse waves 1, 3 and 5 are highly reminiscent of Dow's accumulation, technical trend-following and distribution phases.

It is difficult to imagine two schools of financial thought more divergent than the capital asset pricing model and Elliot's wave principle. Yet both of these concepts owe much to the original work of Charles Dow, the "great-great grandfather of technical analysis."



Interpreting Charts

Technical analysts have often been distinguished into two camps: "chartists" and "statisticians." A statistician relies upon a numerical approach to technical market forecasting. A chartist relies upon trends and patterns observed in a graphic representation of market behavior.

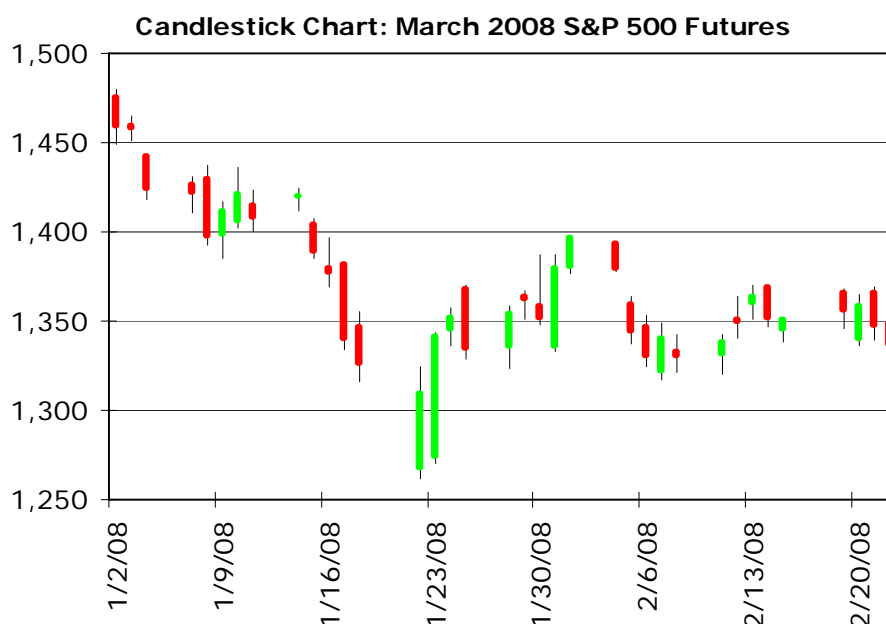
The "bar charts" is one of the most commonly referenced types of charts. A bar chart provides a vast wealth of information about market price movements, volume and open interest. It is characterized by a series of vertical bars which depict the lowest price traded on a given day and the highest price traded on a given day against a horizontal axis depicting sequential dates. Off to the right of the bar a short tick or slash is used to indicate the closing or settlement price of the day. Sometimes a similar slash is used off to the left of the bar to indicate the opening price of the day. Bar charts also might incorporate information regarding volume (in the form of bars at the bottom of the chart) and open interest (a line running through the bars at the bottom of the chart). In addition to providing information about price, volume and open interest, bar charts provide information about market volatility and timing. Volatility may be observed in the height of the vertical bars. Timing may be observed in terms of the horizontal length over which a trend or pricing pattern persists.

A bar chart is a commonly referenced device to analyze market activity. It incorporates information regarding the open, high, low and close. Sometimes it also includes information regarding volume and open interest.

Candlestick charts are closely related to bar charts and likewise depict the open, high, low and closing prices. But they do so in a way that is often a bit more readable.

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A close cousin to the classic bar chart is the Japanese candlestick chart. The candlestick chart likewise depicts the open, high, low and close. However, the candlestick chart may be a bit easier to read at a glance to the extent that the body of the daily entry is thickened between the opening and closing prices. While conventions may be a bit different in different parts of the world, it is commonplace in the U.S. to fill in the body of the graph in green if the close is higher than the open; or, in red if the close should fall lower than the open. Candlestick charts date back several centuries in Japan and a complete body of interpretative constructions have been developed around the candlestick chart. To a large extent, classic Japanese interpretations are paralleled in classic western. interpretations. For our purposes, we adopt a hybrid approach by generally utilizing Japanese candlesticks charts while applying classic chart interpretations of western origin.

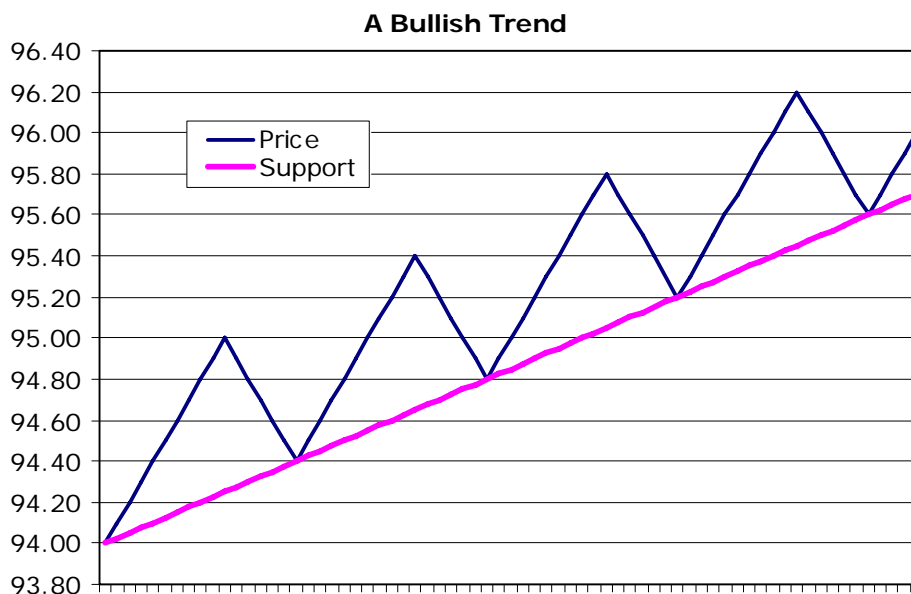


A bullish trend is characterized by a series of higher peaks and higher troughs. A bearish trend is characterized by a series of lower peaks and lower troughs.

The Trend - The first and foremost issue in the minds of many technical traders centers about the existence or non-existence of a "trend." A trend may be bullish, bearish or sideways (neutral). A bullish trend is indicated by a series of successively higher and higher peaks coupled with a series of successively higher and higher troughs, *i.e.*, higher highs and higher lows. A bearish trend is indicated by a series of successively lower and lower troughs coupled with a series of successively lower and lower peaks, *i.e.*, lower lows and lower highs. The trend is found by studying peaks and troughs in market movements. A bullish trend is characterized by a series of higher peaks and higher troughs; a bearish trend is confirmed by a series of lower troughs and lower peaks.

Trends may be enforced by the existence of "support" or "resistance" in a bullish or bearish market, respectively. Support may be thought of as

buying pressure as the market falls into a trough or a "reaction low." Resistance may be thought of as selling pressure as the market rallies into a peak or a "reaction high." Areas where support or resistance may be encountered may be estimated by drawing a "trendline" on the chart. A bullish trendline (support) may be found by connecting a straight line under a series of higher and higher troughs. A bearish trendline (resistance) may be found by connecting a straight line over a series of lower and lower peaks.



When connecting just two troughs or two peaks, you have established a "tentative" trendline. Subsequently, you will look for a third return to the trendline in order to confirm the tentative trendline. The strength of a potential support or resistance area on the chart may be estimated on the basis of a number of factors: (1) volume; (2) duration; (3) recency; (4) round numbers.

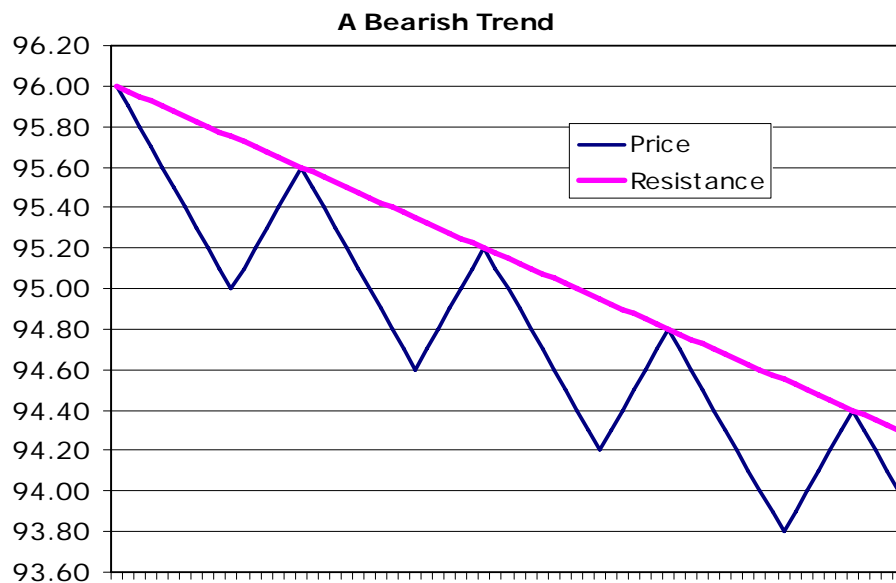
Trends may, for example, be confirmed by advancing volume driving prices up to a peak in a bullish market; or, advancing volume driving prices down to a trough in a bearish market. Volume should fall off on a reaction low in a bull market and on a reaction high in a bear market. The more volume traded as the market approaches the support or resistance levels, the stronger those support or resistance levels are considered.

Another way of assessing the strength of a support or resistance level is to watch the amount of time spent trading near such an area. The longer time spent trading at or near these areas, the more significant that area may be considered. This is intuitive because if the market spends a great deal of time "testing" a support or resistance and it still holds, this suggests great strength. The more recently you have been trading near a support or resistance area, the stronger that area is likely to be. This is

Chartists look for support below the market or resistance above the market. Support is often depicted in the form of a trendline connecting, in the case of a bullish trend, a series of higher troughs. Likewise, resistance may be depicted as a trendline connecting, in the case of a bearish trend, a series of lower peaks.

The strength of support or resistance may be assessed by reference to volumes traded; the duration or time spent near support or resistance; recency or how much time has elapsed since the market was last at the relevant price level; and, round numbers noting that a common reference may be more powerful than some odd number.

intuitive in the sense that if support or resistance at any particular area has held firm in the recent past, it is likely to remain firm in the near future.



W.D. Gann studied the value of round number, breaking trends into halves, thirds, quarters, eighths, etc.

Finally, traders often associate a great deal of significance with round numbers. For example, a Treasury note futures quote of one-hundred percent of par (100-00) is more likely to have some psychological significance than a quote like 99-23. In fact, the famous commodity and stock analyst W.D. Gann spent a great deal of time looking at the value of round numbers. Gann would break a range into halves, thirds, quarters and eighths, assessing less and less significance to each successively finer and finer division. Consider, for example, a situation where Eurodollar futures are trading between 95.00 and 96.00. Gann might break that range into halves, identifying 95.50 as a potentially significant support or resistance level. Other potentially significant areas might be 95.33 and 95.67 (thirds); 95.25 and 95.75 (quarters); 95.12, 95.37, 95.63 and 95.88 (eighths).

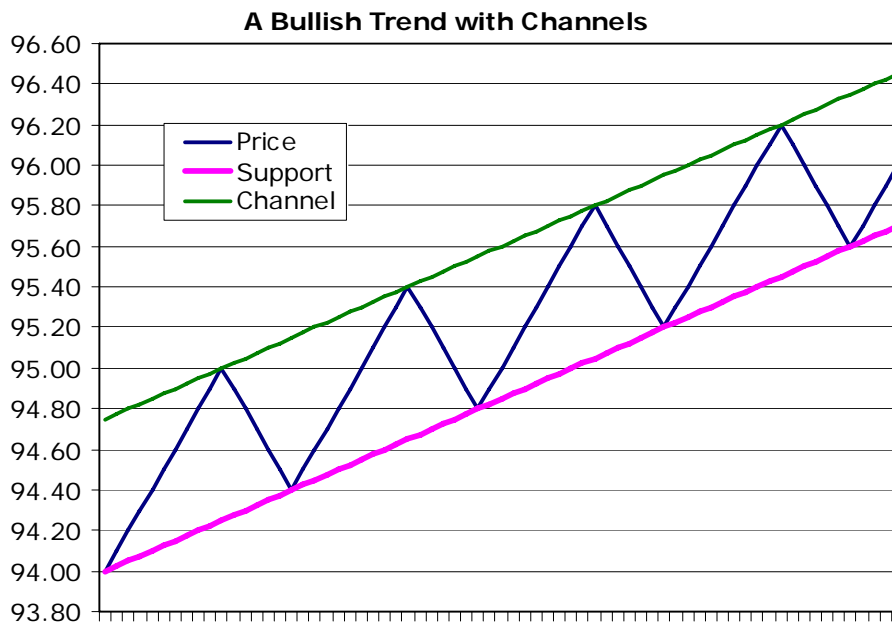
Once broken, support becomes resistance. Once broken, resistance becomes support.

How can you tell whether these levels will represent support or resistance? If the market is above the level, then it may provide support but if the market is below the level, it may provide resistance. This is a variation of the idea that once broken, support becomes resistance; once broken, resistance becomes support. As a rule, it is probably best to avoid placing limit orders precisely at a support or resistance level which is deemed significant. If a significant support or resistance level is hit, the market may react strongly with a sharp advance or decline. This may mean that your broker will be unable to fill a limit order at the specified price.

Place limit orders to buy just above support and limit orders to sell just below resistance.

It is usually best to place a limit buy order just above a support level and a limit sell order just below a resistance level in order to assure a fill. But why should these perceived support or resistance areas be expected actually to hold? Some observers say that there are three kinds of market

participants: longs, shorts and the uncommitted. All three groups are psychologically committed to enforcing support in a bull market. Longs are looking for the next dip to a support level in order to add to an existing profitable long position. Shorts are looking for the next dip as a good opportunity to cut their losses. Finally, the uncommitted are looking for the next dip in order to establish a new position and participate in the bullish trend.



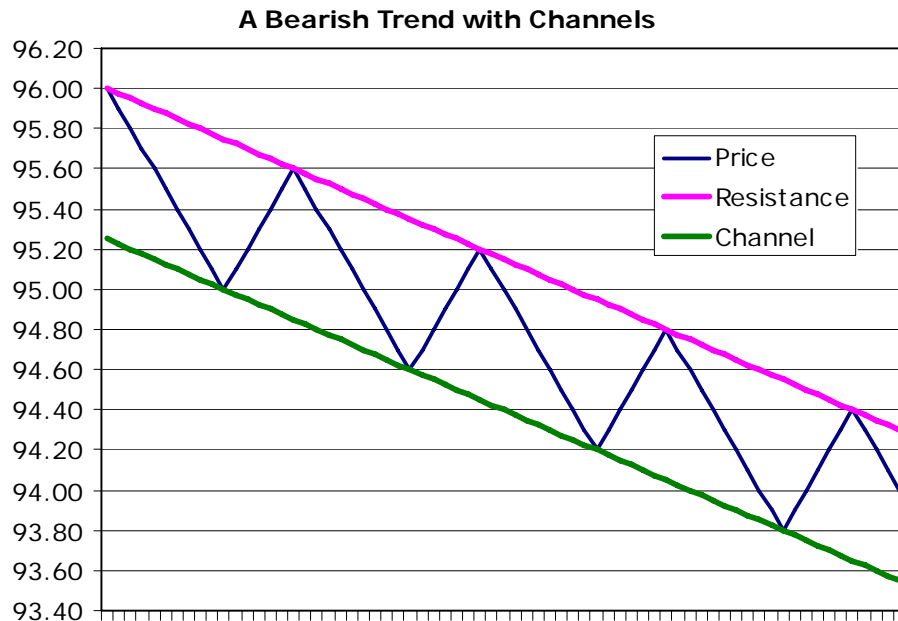
Support and resistance are said to be characteristic of a bull and a bear market, respectively. Many traders, however, identify lines which run parallel to bull and bear trendlines. By connecting a series of higher and higher peaks in a bull market, you have identified a bullish channel. A series of lower and lower troughs may be connected in a bear market and identified as a bearish channel.

A channel is found by studying peaks and troughs in market movements. A bullish channel is identified by connecting a series of higher and higher peaks in a bull market; a bearish channel is identified by connecting a series of lower and lower troughs in a bear market. While channels are frequently identified in bull and bear markets, they are generally weaker and more "ragged" than the support or resistance levels that they parallel.

These channels should run parallel to the support or resistance levels and may provide a useful indication of where to take profits. For example, a long in a bull market may buy on the troughs and take profits on the peaks; a short in a bear market may sell on the peaks and take profits on the troughs. But the market may not always reach the channel level. Often, the first sign of a reversal is the failure of the market to achieve a channel level.

A bullish channel is identified by connecting the series of higher highs in a bull market. Or, by connecting the series of lower troughs in a bear market.

These channels may be useful as indicators of where to take shorter term profits.



What happens if a trendline should be broken? A broken support or resistance level is a necessary condition to signal a reversal of the market trend. But it is not a sufficient condition. Trendlines are often penetrated and yet the market continues to trend in a bullish or bearish direction. As a result, many analysts apply "filters" to help them determine whether any given penetration constitutes a legitimate break of the trendline. For example, a penetration of a trendline on an intra-day basis is generally not regarded as significant. Many analysts look for a penetration of a trendline on the market close or settlement. Some analysts are not convinced unless the market trades through a support or resistance level for 2 or 3 consecutive days. Others are not convinced unless that break accounts for perhaps 2% to 3% of the previous market trend, measured from the lowest trough to the highest peak achieved during the duration of the trend.

Traders sometimes apply filters to determine whether a trendline is truly broken. These filters may be defined in terms of the amount by which the market trades through a trendline or in terms of duration for which the market has broken the trendline.

Assume, however, that a trendline is broken, satisfying the added rigor of a filter application. This still does not necessarily suggest that the trend itself is broken. It may simply mean that the trendline as drawn is "unsustainable." A trendline can be unsustainably steep or even unsustainably shallow. A "sustainable" rate of advance or decline is thought to be measured as a 45 degree angle. Forty-five degrees may be meaningless, however, to the extent that the size of one's window on a computer screen could make a great deal of difference with respect to the angle. Call this the "classic wisdom" with respect to this point. But if a sufficient number of traders might subscribe to this "classic wisdom," it may become self-fulfilling and, therefore, this might suggest the use of commonly available charting systems or tools to assure a common reference.

In any event, it is commonplace to "fan-up" trendlines drawn initially at too shallow an angle. Or, to "fan-down" trendlines drawn at too steep an angle. One rule of thumb, however, is that once you have penetrated three (3) "fanned" trendlines, then trend reversal is imminent. Call this the "three strikes" rule.

How far can the market be expected to travel on a valid trend penetration? Many analysts rely upon "percentage retracement" guides. The first issue is: how far can a market trend be retraced? Obviously a movement can only be retraced up to 100% of the original movement. But once a retracement or reversal begins, analysts often look for a one-third, one-half or two-thirds retracement. Assume that Eurodollar futures have experienced a rally from 95.00 to 96.00, measured from the lowest trough to the highest peak. But now the market shows signs of reversing or retracing that 100 basis point movement. Look for support at the one-third retracement level (95.67), the one-half retracement level (95.50) and the two-thirds retracement level (95.33).

Other analysts disagree with respect to the one-third or 33% level and the two-thirds or 67% level. Some claim that it is more appropriate to identify the 38% (support at 95.62) and 62% (support at 95.38) retracement levels. These alternate 38% and 62% levels are derived from the so-called Fibonacci number series. The Fibonacci number series goes [1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144 . . .]. Note that each number is derived by adding together the prior two numbers. This number series has some interesting and unique properties. For example, if you divide any number in the series by the prior number, the result will be remarkably consistent at about 1.618. (This only works well after the first few numbers in the series.

How far might a market move if it has broken a trend? Some traders look for retracement of one-third, one-half or two-thirds of the original movement.

Other traders refer to Fibonacci numbers to analyze the market. The Fibonacci number series includes ... 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144 ... Each number represents the sum of the prior two numbers.

Properties of Fibonacci Numbers

$2/1 = 2.000$	$1/2 = 0.500$
$3/2 = 1.500$	$2/3 = 0.667$
$5/3 = 1.667$	$3/5 = 0.600$
$13/8 = 1.625$	$8/13 = 0.615$
$21/13 = 1.615$	$13/21 = 0.619$
$34/21 = 1.619$	$21/34 = 0.618$
$55/34 = 1.618$	$34/55 = 0.618$
$89/55 = 1.618$	$55/89 = 0.618$
$144/89 = 1.618$	$89/144 = 0.618$

By dividing any number in the series by the next number, the result will be remarkably consistent at about 0.618. The reciprocal of 0.618 (1/0.618) is 1.618. The reciprocal of 1.618 (1/1.618) is 0.618. More will be said about the remarkable properties of the Fibonacci number series

later. The point is that traders often attribute significance to these numbers. The 62% retracement level is derived from the number 0.618. The 38% retracement level is simply 100 percent less the 62 percent figure.

Reversals may be identified in the form of a market top or a market bottom.

Reversal Patterns - A reversal pattern is a formation, identified on a bar chart, the initial stages of which may suggest that a reversal of a market trend is imminent. A "top" may occur at the completion of a sustained bull movement, signaling an imminent bear market. A "bottom" occurs at the completion of a sustained bear movement, signaling the beginning of a bull movement. A reversal represents a formation on a chart which indicates the end of a sustained movement and the beginning of a new movement. A top indicates the conclusion of a bull movement and the inception of a bear movement. A bottom indicates the conclusion of a bear movement and the inception of a bull movement.

Reversals should be distinguished from a simple consolidation or pause in the trend.

It is important to be able to distinguish a reversal from a consolidation pattern. A consolidation pattern is simply an area on the chart where the market takes a pause before it can continue to trend in the previously established direction. A reversal pattern indicates that the market is now ready to trade in a direction opposite the previously established direction.

The first sign of a reversal is the penetration of a trendline.

The first early warning sign associated with a market reversal will be a penetration of a trendline. This suggests, of course, that the market had previously been trending either up or down. Of course, a simple penetration may or may not signal a reversal. It may simply indicate that the trend is moving at an unsustainable angle and that your trendlines require adjustment.

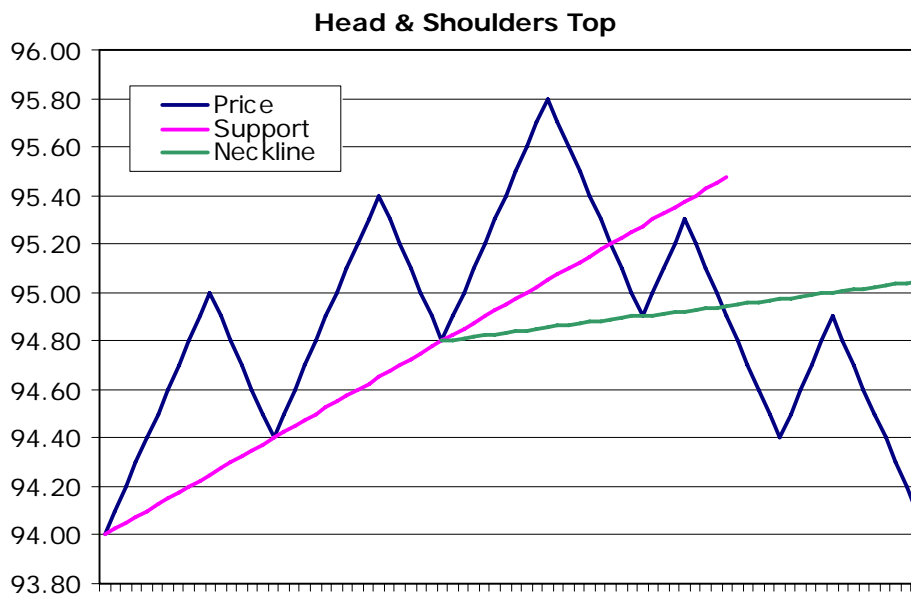
The head and shoulders formation is the most widely recognized of the 5 common reversal patterns considered here. The head and shoulders pattern features a peak in between a left and a right shoulder.

This section will explore five commonly referenced reversal patterns. Those five patterns include the (1) head and shoulders; (2) triple top or bottom; (3) double top or bottom; (4) rounded bottom; and, (5) spike or "V" top.

The head and shoulders formation is the most widely recognized of the five reversal patterns named above. The "H&S" pattern is typified by three peaks or a "left and right shoulder" coupled with a higher peak known as the "head" in between. Perhaps the best way to describe the head and shoulders formation is to examine the chart closely, identifying early warning signs which may portend of the coming reversal. In the early stages of the H&S, there are generally no warning signs at all that a reversal might be on the horizon. Volume may in fact surge upwards on the bullish movement up to the left shoulder associated with a topping H&S.

Subsequently, one may see the market decline to the nape of the "neckline," or the trough between the left shoulder and head, on reduced volume. Still, there is no indication of a reversal because the market has simply returned to a support trendline as might normally be expected. The next surge upwards to the head still provides no clear indication of a possible reversal. Sometimes, however, volume on this upward surge falls short of the volume on the prior upward surge to the left shoulder. The market then declines through the support level, down to the nape of the neckline or the trough between the head and the right shoulder.

Declining volume on the upward surge to the head is a sign of weakness and may indicate that you are in a reversal pattern.



Once the two troughs between the head and the right and left shoulders are formed, one may draw in a "neckline." It is important to identify the slope of this neckline. The neckline associated with a true H&S formation tends to slope in the general direction in which the market was trending before entering the pattern. If the neckline slopes downwards in a topping H&S, then one may suspect that the formation may actually turn out to be a consolidation, rather than a reversal, pattern. On the next upward surge to the right shoulder, expect to see light volume. Once broken, the roles of support and resistance are reversed. Thus, what was once support in a bullish market now becomes resistance. The market bounces down off the resistance level and races through the neckline. The penetration of the neckline completes the H&S pattern.

The slope between the troughs between the right and left shoulders forms the neckline of the formation. The neckline should slant in the general direction of the previous trend. Once broken on the down side, that neckline represents resistance and indicates that the head and shoulders formation is complete.

It is important to measure the strength of the downward surge through the neckline. This strength or weakness may be assessed by looking at the volume traded on the break and the degree to which the neckline is penetrated. If that downward surge is strong (heavy volume and a "clean" break of the neckline), then it is less likely to be a "false break." When volume on the neckline break is weak, then it may be likely that the

market will rally to "test" the neckline before resuming a downward trend (if the movement in fact results in a reversal).

Once the neckline is broken, look for support at the one-third, one-half and two-thirds retracement levels. Or, if you prefer reference to Fibonacci numbers, the 38%, 50% and 62% retracement levels.

Once the neckline is broken, you should begin looking for support at the one-third, one-half and two-thirds retracement levels. (Or, at the 38%, 50% or 62% levels if you prefer.) But there is an even more direct way of identifying the vertical movement subsequent to a break in the neckline. The minimum expected movement on the break of a neckline may be estimated by measured the vertical distance from the peak of the head downwards to the neckline.

This suggests that the size of the pattern is an important indication of the expected subsequent market movement. The size of the pattern may be measured in two dimensions including vertical height and horizontal width. The vertical measure of the pattern is an indication of volatility. The horizontal width of the pattern is an indication of duration or time spent while trading in the pattern.

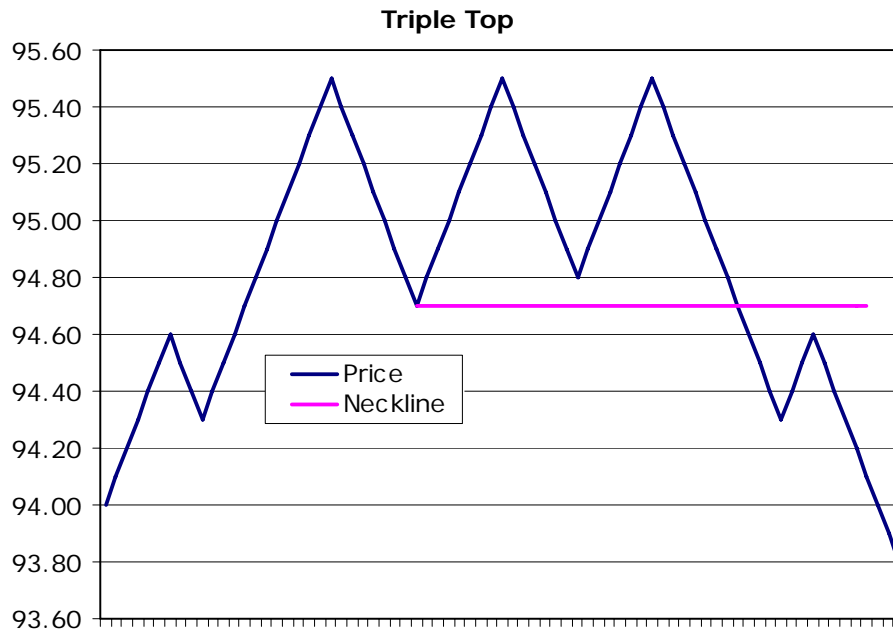
Market tops tend to be volatile but require less time to form. Market bottoms tend to be less volatile but require more time to form.

As a general rule, market tops or the reversal of a bullish trend, tend to be more volatile but take less time to form. *I.e.*, tops tend to be characterized by large vertical height but relatively narrow width. Market bottoms, or the reversal of a bearish trend, tend to be less volatile but take a longer time to form. *I.e.*, bottoms tend to be characterized by relatively low vertical height but relatively wider width. This suggests that bottoms may be a bit easier to trade than tops since you will generally have more early warning signals when there is less volatility.

The triple top or bottom features three peaks (a top) or three troughs (a bottom) or near equivalent height on the chart.

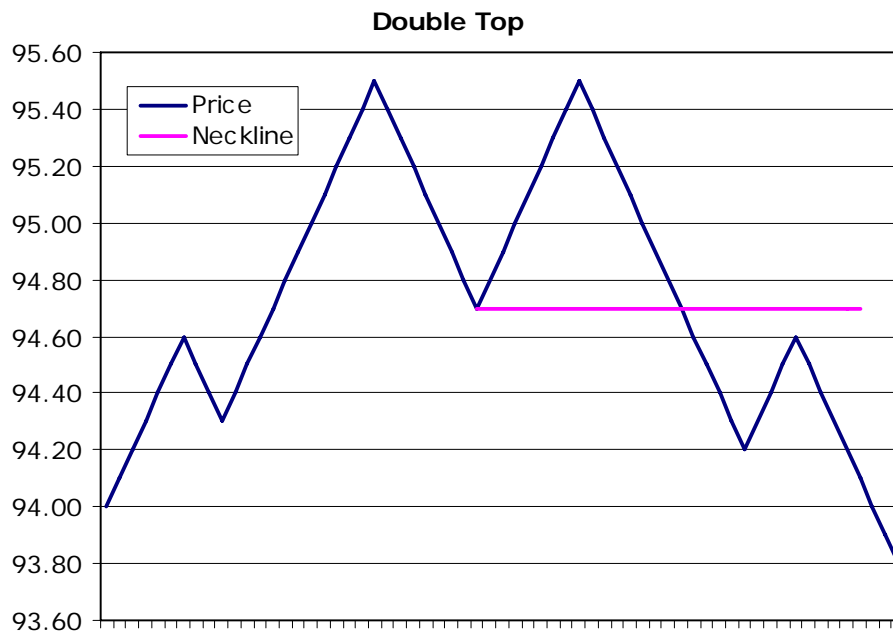
The triple top or bottom strongly resembles a head and shoulders top or bottom with the exception that all three peaks (in a top) or troughs (in a bottom) are of relatively equivalent height. This, of course, represents an infrequently observed pattern to the extent that it would be rare to see three peaks all of very similar height.

The volume pattern associated with this formation is strikingly similar to that of a head and shoulders. In other words, you may see a strong volume surge up to the first peak (down to the first trough) in a topping (bottom) pattern. A bit less volume may be observed on the next surge with very low volume on the final surge. Finally, volume should increase on a break of the "neckline" which may be drawn by connecting the troughs (on a top) or the peaks (on a bottom). The minimum price movement on the break is thought to be equal to the maximum vertical height of the pattern. (This is consistent with the idea that the larger the pattern, the greater the subsequent price movement.)



The double top or bottom is a very common kind of reversal. It is similar to the triple reversal except, as suggested by its name, it is characterized by only two roughly equal peaks (in a top) or troughs (in a bottom). In general, you expect volume to be a bit lighter on the second peak or trough relative to the first peak or trough. Subsequently, the market may break through the support or resistance (in a bull and bear market, respectively). Then, the market may break below (above) the trough (peak) formed between the two peaks (troughs). These breaks should be on increased volume to confirm the reversal.

A double top or bottom is a common reversal featuring two peaks (a top) or two troughs (a bottom) of near equivalent height.

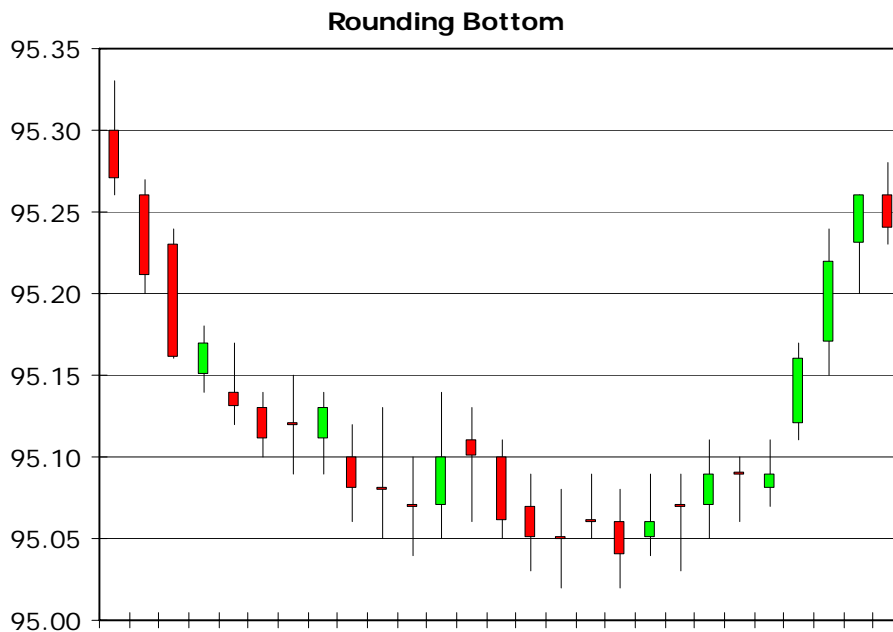


A rounded bottom features reasonably gently rounding price formation, typically over a rather extended period of time. This formation is characteristic of a bottom and not a top.

A rounded bottom is a pattern characterized by low volatility and relatively long duration. These features are, of course, more characteristic of a bottom pattern than a topping pattern. As such, this rounded reversal formation is generally thought of as typical of the reversal of a bear, rather than a bull, trend. Volume and volatility fall off while the market is in this pattern. While the market is trading in a rounding bottom, it is essentially being "lulled to sleep" over an extended period of time. Little or no fundamental information may be released during this period.

Subsequently, the market break is accompanied by a burst of volume and a flurry of activity. This volume is said to be "stored up" during the lull. Often, this break is the result of new fundamental information which becomes known in the marketplace. It is difficult to trade a rounding bottom because there is generally little indication with respect to when the market will break. Nor is there any indication with respect to the magnitude of that break.

A rounding pattern is much more common in the "traditional" futures markets (grains, livestock, metals) relative to the financial markets. This may be attributed to the fact that fundamental news which impacts upon the agricultural markets, for example, is not released with the same frequency as is news which impacts upon the financials.

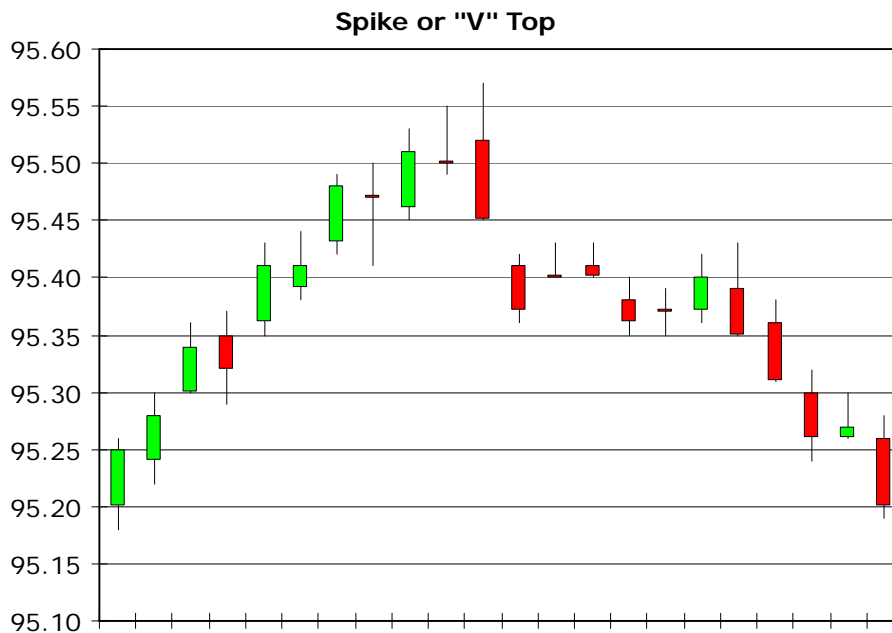


Almost every day a news release regarding some fundamental measure of economic activity, inflation, government fiscal or monetary policy hits the financial markets. But soybean crop reports, for example, are not made known with the same kind of frequency even in the growing season. In the winter months, many agricultural markets can become quite inactive. Thus, the possibility of a rounding pattern with low volume and volatility

over an extended period of time becomes quite possible. If the rounded bottom is more typical of a "traditional" futures market than a financial futures market, a "V" formation is more typical of a financial rather than a traditional market. In this and in other respects, the "V" or spike pattern is the antithesis of the rounding bottom.

A "V" or spike pattern more commonly occurs at a top than a bottom. It is characterized by high volatility over an extremely short period of time. Because the reversal occurs so sharply, it is often referred to as a "V" or, to be more precise, an inverted "V" formation. In fact, the pattern may begin and end within the course of a single day. This single day is sometimes referred to as the "key reversal day." A great deal of volume and volatility is realized on a key reversal day. A key reversal often results in a limit movement. Generally, the market will reach a new high on the key day followed by a sudden decline, often as a result of new fundamental news. The market may close at or near the low of the day which extends below the low for the previous day or two.

A "V" or spike top features a sudden unexpected break through previous trendlines. Like many tops, market movements are volatile and occur swiftly over a reasonably short period of time.



Like the rounded bottom, there is little or no warning before the reversal takes place so it is difficult to trade profitably. But sometimes, there are early warning signs. Market gaps are reasonably commonplace before and after key reversal days. A market gap is an area on the chart where no trading takes place. If you see the market gap upwards on light volume, this may portend a subsequent reversal. Sometimes, the market gaps down on heavy volume subsequent to a key reversal. In that case, the formation may be referred to as an "island reversal." More will be said about gaps later in this text.

Gaps in market prices may be observed in the context of a "V" or spiked top.

Another sign of a possible reversal may be extremely high open interest. Growth in open interest in a volatile market may be unsustainable. In the long-term, volume tends to rise and open interest falls in a volatile market environment. The reason is intuitive: opportunities are frequently available in a volatile market and you need not hold positions overnight to take advantage of it. When the market is trending upwards on high volatility with growing open interest, any "crack" in those long positions may result in a panic sell situation. *I.e.*, if a significant number of the longs start to "take profits" by selling, others may follow, accelerating the decline.

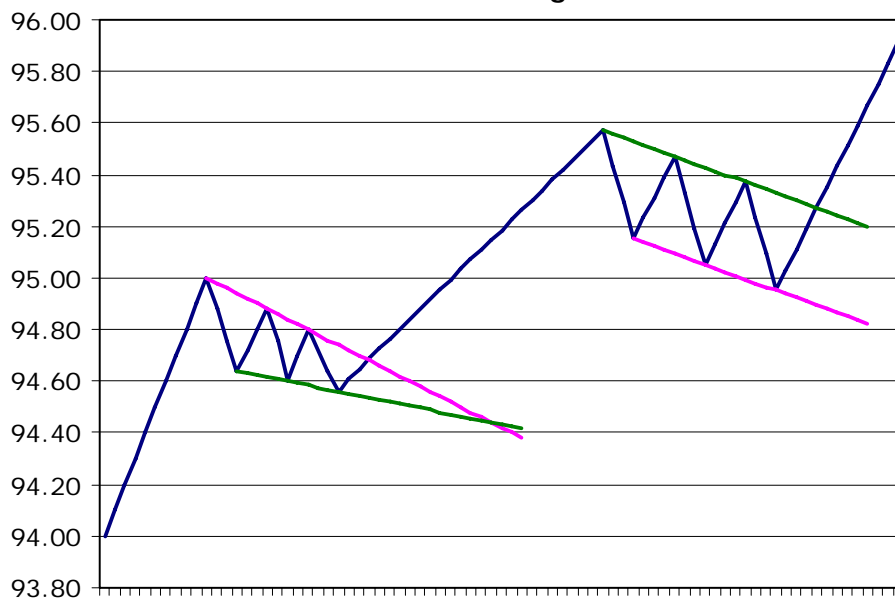
A consolidation represents a pause but not a reversal of the market trend.

Consolidation Patterns – A consolidation pattern represents an interruption of a trend. The market trades "sideways" for a while before it can continue in its bullish or bearish pattern. A consolidation pattern occurs when the market trades in a neutral holding pattern for a limited period of time before resuming the direction in which it was trending prior to entering the pattern. There are a number of common consolidation patterns including ... (1) pennants and flags; (2) symmetrical, ascending, descending or expanding triangles; (3) wedge or diagonal triangle; and (4) sideways channel.

A pennant or flag is perhaps the most common consolidation pattern. The market falls away from the previous trend only to break out to the upside and resume the trend.

The pennant or flag is a very common consolidation pattern. Essentially, it is an indication of a market which has moved too far too fast. Market participants may be tempted to take some profits, to rethink their strategies, to "regroup" before continuing to trade aggressively.

Pennant and Flag



A pennant differs from a flag in that the flag is more rectangular while the pennant more closely resembles a triangular pattern. Both patterns tend to slant or point away from the general market direction. If the market is

generally bullish, for example, a flag or pennant will trend in a bearish direction. If the market is generally bearish, the flag or pennant will trend in a bullish direction.

But this trend against the market direction tends to be short-lived. Flags and pennants are generally completed within 2-3 weeks or less from the time that the "pullback" begins. Subsequently, these patterns are thought to be very "reliable" in the sense that they almost invariably result in a continuation of the prior market trend. One old market saying goes "flags and pennants fly at half- mast." This suggests that flags and pennants may be observed about midway in a major market movement. But this way of thinking may be incompatible with Elliot Wave Theory.

Flags and pennants tend to be reliable continuation patterns completed within perhaps 2-3 weeks at most.

Elliot Wave Theory suggests that the market may ratchet up in a five wave pattern including three "impulse" waves (waves 1, 3 and 5) with two intervening "corrective" waves (waves 2 and 4). If waves 2 and 4 take the form of a flag or a pennant, then it is clear that these patterns cannot "fly at half-mast." But what if the second wave "b" of the following three step corrective phase (a, b and c) takes the form of a flag or pennant? Under those circumstances, the flag or pennant may in fact "fly at half mast."

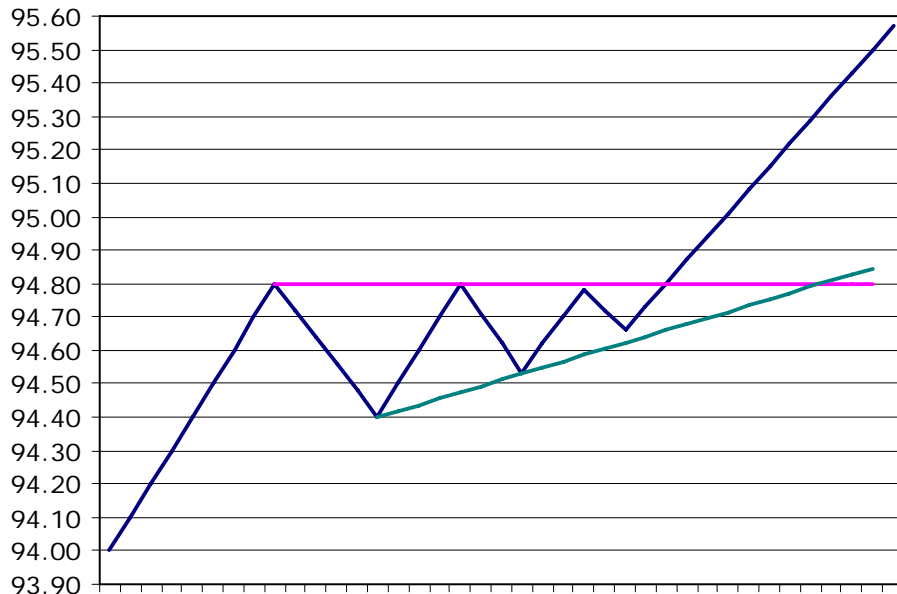
Triangles are very similar in terms of their shape to pennants. Yet they differ in a number of key respects. Foremost amongst these differences is that a triangle is generally thought of as a longer-term consolidation pattern. A pattern which may take several different, yet similar, forms. A triangle is characterized by converging support and resistance levels which meet in the future at a point referred to as the "apex." But this triangle may take the shape of a (1) symmetrical triangle; (2) ascending triangle; or (3) descending triangle.

Triangles are similar to pennants but they tend to require a longer period of time to form.

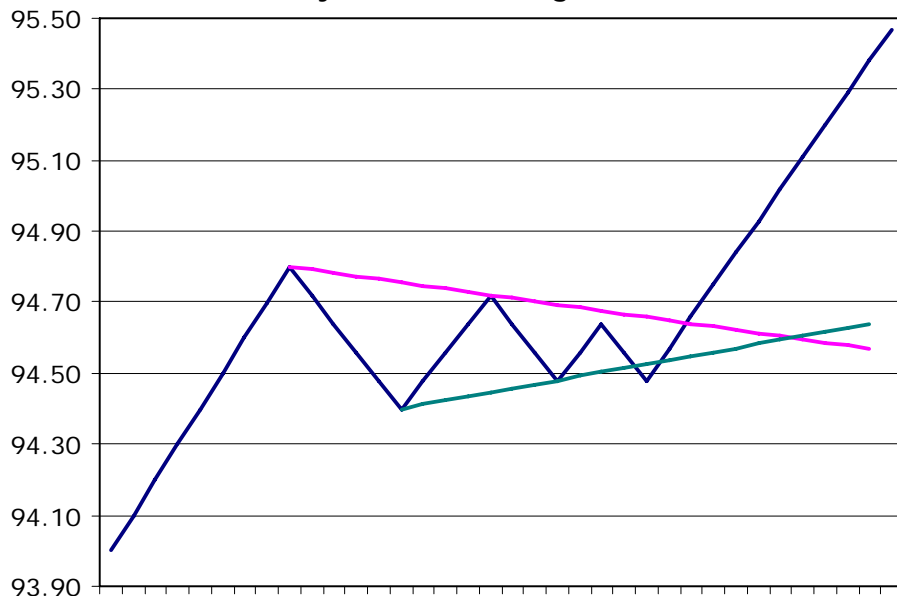
A "symmetrical" triangle is characterized by an upwards sloping support trendline coupled with a downwards sloping resistance trendline. An "ascending triangle" is characterized by a flat resistance trendline and an upwardly sloping support level. Finally, a "descending triangle" is characterized by a flat support trendline and a downwardly sloping resistance level. Despite the somewhat different inclinations associated with these three kinds of triangles, they all share some common characteristics. Volume and volatility, for example, are expected to decline as you trade into any of these three triangular formations. Subsequently, the triangle is concluded with a sharp, sudden breakout as the market begins, once again, to trend.

A symmetrical triangle features upwards sloping support and downwards sloping resistance trendlines. An ascending triangle features upwards sloping support and flat resistance. A descending triangle features downwards sloping resistance and flat support.

Ascending Triangle



Symmetrical Triangle

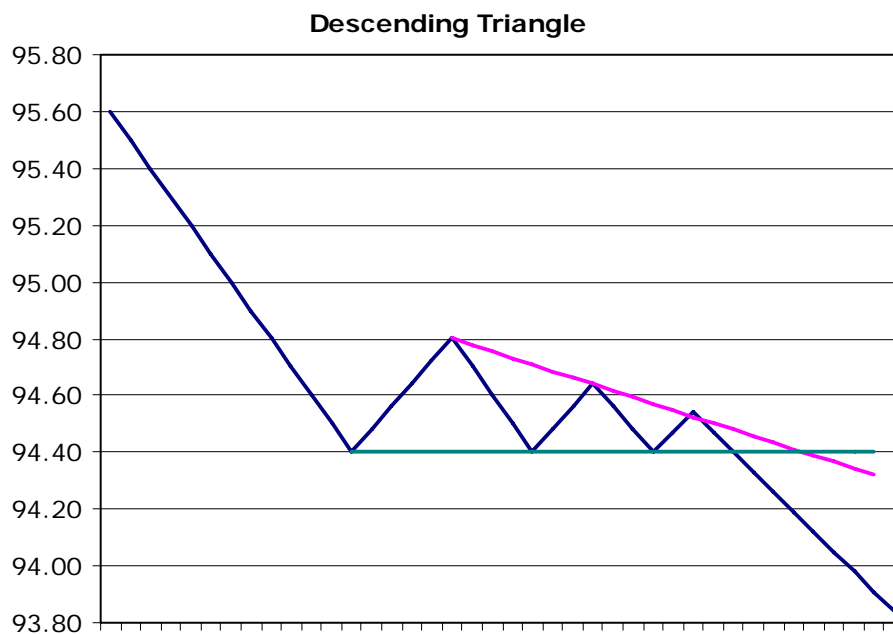


Triangles are usually thought of as consolidation patterns. But perhaps one-third of the time, they may result in a reversal rather than a consolidation.

But the direction in which this breakout may occur is unknown. Triangles are generally thought of as consolidation patterns. As such, it is believed that triangles are most likely to result in a continuation of the trend which had been established prior to the formation of the triangle. Sometimes, triangles result in a reversal rather than a continuation of the trend. Many analysts would attach perhaps a two-thirds probability to the possibility of a continuation with a one-third probability to the possibility of a subsequent reversal. Many analysts would attach probability a bit greater than two-thirds to an upwards or downwards break on the conclusion of an ascending or descending triangle, respectively.

Triangles are generally thought of as rather longer-term patterns. By this we mean that a triangle may continue for perhaps upwards of two to three weeks. What market conditions may portend a breakout? Technical analysts often measure a triangle horizontally from the beginning of the formation out to the apex (where the support and resistance trendlines converge). The breakout is believed to be likely to occur somewhere between the one-half way point and the three-quarters of the way point to the apex. Elliot Wave Theory provides an even more complete description of the nature of a triangle. According to Elliot, a triangle will be composed of five waves so let us refer to these waves as A, B, C, D and E. Thus, one might start anticipating a breakout as the market trends into the one-half to three-quarters to the apex area and as the market completes a fifth wave within the triangle.

Look for a breakout of a triangle when the formation is one-half to three-quarters of the way towards the apex. The apex represents the intersection of the converging support and resistance trendlines.



Because the market is essentially neutral while trading in a triangle, traders may prefer to apply neutral option trading strategies (short straddles, short strangles). Unfortunately, it is only when three legs (A, B and C) and four points are formed that one may identify a triangle. One cannot identify a triangle without four points to form converging support and resistance levels. By the time four points are formed and the triangle identified, the triangle may be close to achieving a breakout. Thus, it may be risky to sell straddles and strangles at this point. But when a breakout is imminent, many traders prefer to buy straddles and strangles in anticipation of a big market break.

It may require some time to identify the triangle as one needs to see two peaks and two troughs to create the support and resistance trendlines.

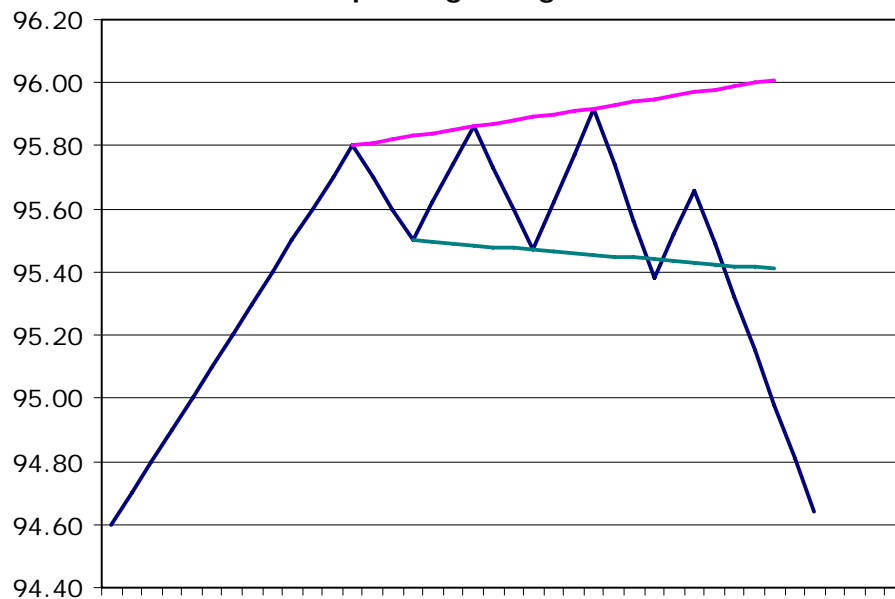
Similar to the reversal patterns discussed above, the triangle provides an indication with respect to the size of the movement upon a breakout. By measuring the vertical height of the triangle at its widest point (at the inception of leg A), you can estimate the minimum expected movement

on the break. Sometimes, however, the market does not breakout at all. If the market drifts past the three-quarters of the way point or the apex itself, many analysts believe that the market will continue to drift indeterminately.

An expanding triangle is rather unusual featuring rather wildly increasing volatility. This is a very unreliable pattern and may result in a reversal or a continuation of the previous market trend.

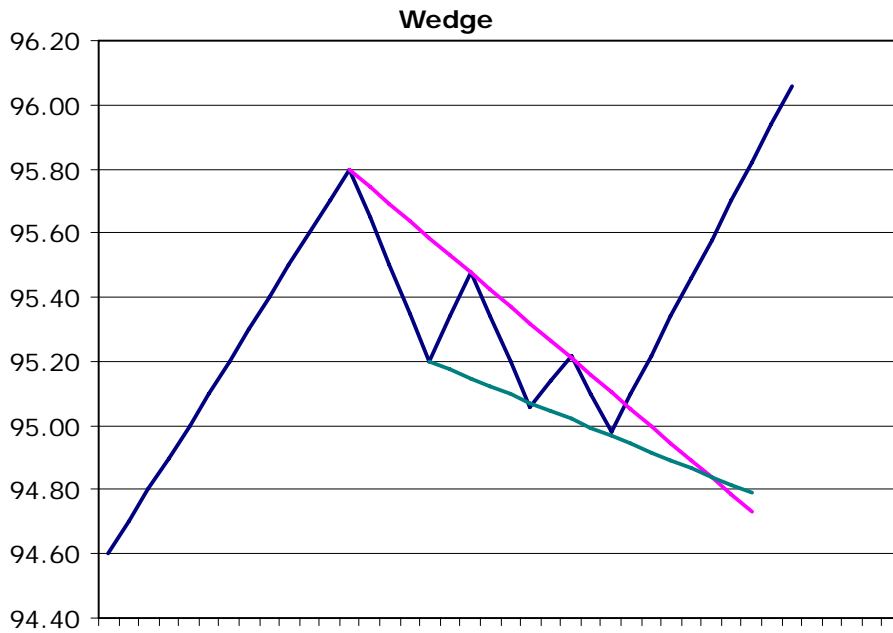
Sometimes, the triangle takes on a fourth, most unusual form as an expanding triangle. An expanding triangle looks like a symmetrical triangle with the exception that it is backwards. *I.e.*, support and resistance trendlines expand rather than converge to an apex. The expanding triangle is unlike most of the reversal and consolidation patterns considered thus far in the sense that it is accompanied by generally increasing, rather than decreasing, volume and volatility. This formation is extremely difficult to trade because it is characteristic of a market which is desperately searching without success for direction. There is no really reliable way of identifying the prospects for an upwards or a downwards break.

Expanding Triangle



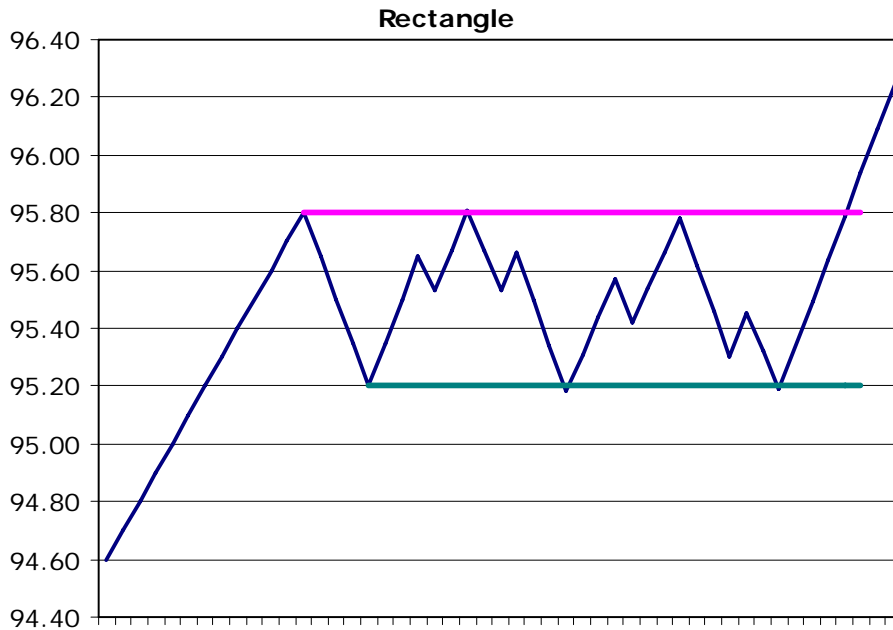
A wedge is much like a pennant in that it slants against the general market trend. But it is a rather longer-term formation as a general rule.

The wedge strongly resembles a triangle in terms of its shape with one notable exception. The wedge generally slants against the general market trend quite sharply. In most other aspects, it is quite like a triangle. It may be thought of as a longer-term formation taking upwards of two to three weeks to form. It tends to break out about one-half to three-quarters of the way to the apex.



The rectangle may be thought of as a neutral trading range. Strong support and strong resistance are evident which means that the market generally drifts sideways for an extended period of time. Generally increased trading activity occurs when the market is trading near either the support or resistance levels. These levels are used to establish new positions and take profits.

A rectangle represents a neutral trading range over an extended period of time.



Price Gaps - A price "gap" represents an area on the chart where no trading activity occurs. Assume, for example, that today's high and low was at 95.36 and 95.28 in the Eurodollar futures market. Tomorrow, the

Gaps may be observed in two varieties: a pattern or a non-pattern gap.

market opens at 95.25 and continues to trend downward. The area between 95.25 and 95.28 represents a price gap. A gap represents an area on a chart characterized by an absence of any trading activity. A gap may have a great deal of significance or it may be essentially meaningless. As such, one may identify two basic kinds of gaps: "pattern" and "non-pattern" gaps.

A non-pattern or common gap appears in illiquid markets and is characterized by low volume. It is usually best to ignore the non-pattern gap as providing little indication of future price direction.

A non-pattern gap is sometimes referred to as a "common gap." This kind of gap may appear often in an illiquid or thinly traded market or when the market is drifting along in a rectangular pattern with no clear market direction. It is characterized by little interest and low volume. From a predictive standpoint, the best advice is simply to discount a non-pattern gap. It usually provides little indication about the strength or weakness of a market trend. In fact, it may appear frequently in a basically trendless market. As such, a common gap is often "filled." *I.e.*, the market will subsequently trade within that area in which the gap was observed.

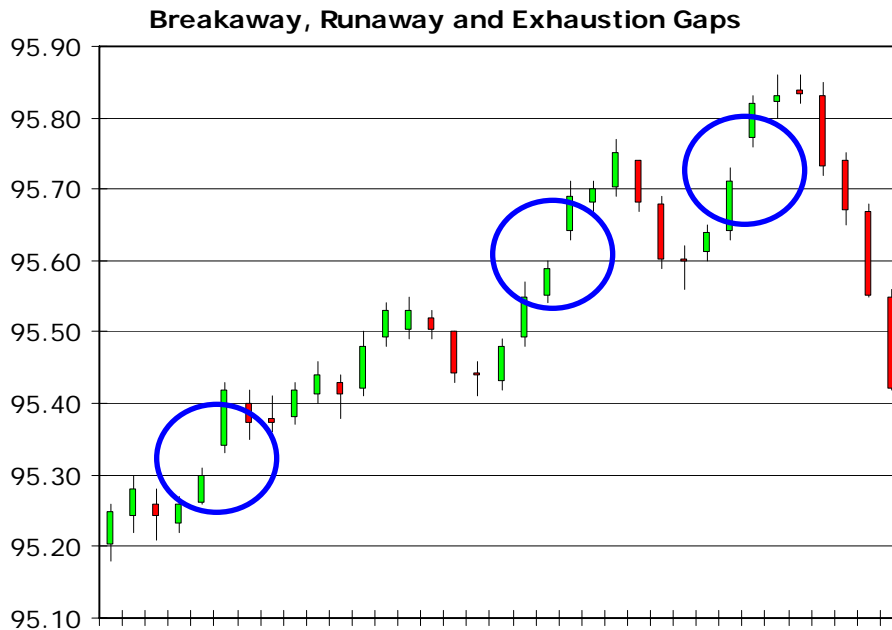
Pattern gaps portend of explosive market movement.

Pattern gaps are altogether different. A pattern gap is generally suggestive of subsequent market movements. Pattern gaps usually occur in very active, liquid markets, often when these active markets are experiencing a great deal of volatility. There are three types of pattern gaps: the "breakaway," the "runaway" and the "exhaustion" gaps.

A breakaway gap occurs early in the trend or in what Dow would have referred to as the accumulation phase of a trend.

The breakaway gap signals the completion of a prior trend and the commencement of a new market trend. *I.e.*, it is likely to occur early in the initial stages of a market movement in the so-called accumulation phase of a market trend. The breakaway gap may occur suddenly with little or no warning, often on the release of explosive fundamental market news. The breakaway gap is not filled. (If it is subsequently filled, then it could not have been a breakaway gap in the first place!) The breakaway gap is characterized by a sudden surge of volume and high volatility. The stronger the volume on the break (particularly on a movement to the upside), the stronger the subsequent market movement.

This gap may be difficult to trade because the market may move dramatically on the initial surge. Unless the trader is extremely astute, in fact, he may have no opportunity to establish a position prior to the gapping movement. Because this initial surge may be extremely strong, the market often needs to consolidate before continuing onward. This may discourage traders from taking a position in anticipation of subsequent movement in the direction of the gapping surge.



The runaway gap generally occurs later in the sequence of events which witness a market movement unfolding. It is generally thought to mark the midway point of a major market movement. Like the breakaway gap, it is characterized by heavy volume. In fact volume may be even heavier on a runaway gap than a breakaway gap. This is intuitive when you consider the phase of the trend in which a runaway gap may occur.

A runaway gap occurs in the mid portion of the trend or the technical trend following phase of the trend.

A runaway gap observed about midway into a major market movement may be realized in the so-called technical trend following phase of the market. The technical trend following phase generally enjoys broader participation and, therefore, may be much stronger than the initial accumulation phase. This suggests that the runaway gap may be very strong.

The exhaustion gap is generally characterized by weak volume and portends a subsequent market reversal or at least a consolidation. An exhaustion gap represents the last gasping movement in a major trend. But be careful insofar as an exhaustion gap does not necessarily mean you should reverse your position. It may suggest, however, that you adopt a less aggressive posture and be poised to liquidate that position when clearer reversal signals appear.

Finally, an exhaustion gap occurs late in the trend in the distribution phase.

Actually, gaps may have become rather difficult to identify in today's market environment that is characterized by near 24-hour per day trading in many markets. Where there is near continuous trading of a particular markets, of course, there tends to be little opportunity for gaps to form on an overnight basis. Thus, the only gaps that might be observed would tend to be as a result of the release of economic news that exerts a major

Gaps may be less frequently observed in today's market to the extent that near 24-hour a day trading in electronic trading forums reduce the probability of seeing "overnight" gaps.

impact upon market prices. In other words, gaps may be more relevant in today's marketplace than they were in years past when trading may have been confined to the daylight business hours in the region where the trading venue was located.

Elliot Wave Theory

Elliot Wave Theory was pioneered by Ralph Nelson Elliot in the 1930s but is still referenced today as an advanced chart pattern recognition scheme.

The guiding principle of Elliot Wave Theory is that trends break down into five waves in the general direction of the trend, followed by 3 consolidative or retracement waves against the general trend.

Elliot also observed that there were "trends within the trend." Or, that larger waves break down into smaller movements also of 5s and 3s.

Elliot broke down these movements by duration from the "grand supercycle" or longest trend to the "minuette" or shortest duration trend.

Ralph Nelson Elliot completed his major works in the 1930s. Nonetheless, Elliot's "wave theory" represents one of the most influential schools of thought affecting the marketplace today. Elliot's influence has been felt quite keenly since the late 1970s when Robert Prechter, perhaps the best known and leading "Elliotician," reintroduced the subject with his book *Elliot Wave Principle*. In the most fundamental sense, Elliot wave theory is based upon three elements: patterns, ratios and time. Far and away the most significant of these three elements is pattern.

Fives and Threes - The fundamental premise (as indicated above) is that the market moves in the direction of the overall trend in a series of five waves followed by three waves which fluctuate against the general trend. Waves 1, 3 and 5 fluctuate with the trend and are referred to as "impulse waves." Waves 2 and 4 represent pullbacks from the trend and are referred to as "corrective waves." The subsequent three wave correction denoted with a, b and c represents a correction of the prior five wave trend. Because the fives are denoted with numbers and the threes denoted with letters, these "phases" are referred to as the numbered and lettered phases.

But Elliot indicates that there are trends within the trend. For example, impulse wave 1 followed by a subsequent corrective wave 2 breaks down into fives and threes of one lesser degree. These waves break down into even smaller patterns of fives and threes of yet one lesser degree.

As discussed earlier, Elliot categorized trends on the basis of general duration. In addition to the primary, secondary and minor trends which Dow identified, Elliot referred to trends of smaller degree including the minute, minuette and sub-minuette. And trends of a longer degree including the cycle, super-cycle and grand supercycle. Prechter developed a notation system which is commonly used to reference these trends summarized in the accompanying table. The grand supercycle is of such extremely long duration that it is considered to be of "no practical significance" by Prechter and is not labeled. Similarly, Prechter leaves the labeling of the minuette and sub-minuette to the imagination of his readers.

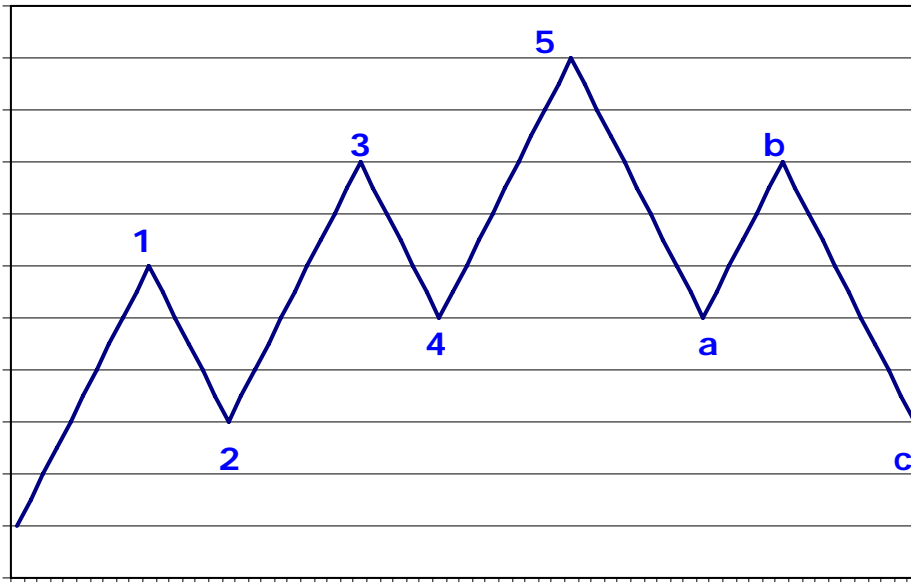
To some, Elliot's ideas may appear to be unfounded. But the basis of Elliot's thoughts is the Fibonacci number series. Note that 5 and 3 are

both Fibonacci numbers. If you add them together, the resulting figure 8 is also a Fibonacci number. When you break a series of fives and threes down into fives and threes of one lesser degree, the resulting figure 34 is also a Fibonacci number.

	5s with Trend	3s vs. Trend
Supercycle	(I) (II) (III) (IV) (V)	(A) (B) (C)
Cycle	I II III IV V	A B C
Primary	① ② ③ ④ ⑤	Ⓐ Ⓑ Ⓒ
Intermediate	(1) (2) (3) (4) (5)	(a) (b) (c)
Minor	1 2 3 4 5	a b c
Minute	i ii iii iv v	- - -

Pursuant to this theme, Elliot also believed that major reversal days in the market may be predicted by counting the number of days forward from the last previous major reversal. Pay particular attention to Fibonacci numbers. The next day on which a significant reversal day may occur should fall on a Fibonacci number.

Elliot's 5's and 3's



Variations on an Impulse Wave - "Fives and threes" represent the normally expected pattern. But Elliot's theories are flexible to the extent that they propose a basic theme and some possible variations on the theme. Let us consider the alternative ways in which impulse waves (waves 1, 3 and 5) may form. In particular: "extensions," "wedges" and "failures."

There are several observed variations on the general theme of 5s and 3s including wave extensions, wedges and failures.

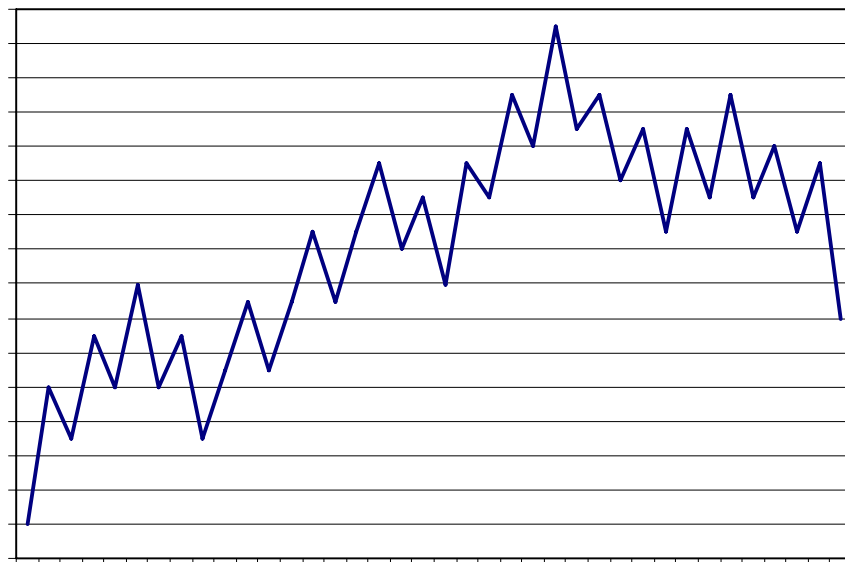
As a general rule, impulse waves tend to be of approximately equal size. (Size can be measured by the vertical height or price movement of a pattern and in terms of its horizontal width or duration.) This is the "rule

Look for impulse waves (waves 1, 3 and 5) in the general direction of the trend to be of generally equivalent height. But sometimes there is a wave extension such that one of the waves is of greater height or duration than the others in the series. The 3rd wave is most likely to extend and is generally not expected to be the shortest of the waves. As a result, corrective waves 1 and 4 should usually not overlap.

of wave equality." But sometimes, even often, one of the impulse waves is larger in terms of its height and width than the other two approximately equal impulse waves. This represents a wave "extension." Wave extensions tend to break down into a series of five smaller waves. Extensions are thought to be most likely to occur during the third impulse wave. This is intuitive to the extent that this wave may represent the "technical trend following" phase of the market. *I.e.*, the wave which surges forth on the weight of a great deal of technical market participation.

Because wave three is generally the strongest and most likely to extend, Elliot suggests that while wave 3 is often the longest, it is never the shortest of the three impulse waves. Because wave 3 is so strong, the downward movement on the subsequent corrective wave 4 should generally not cover the same territory as did wave 1. *I.e.*, waves 1 and 4 should not typically overlap.

Trends with the Trend



The impulse wave least likely to extend may be the first impulse wave. The wave 2 corrective movement may in fact give back move of the wave 1 movement.

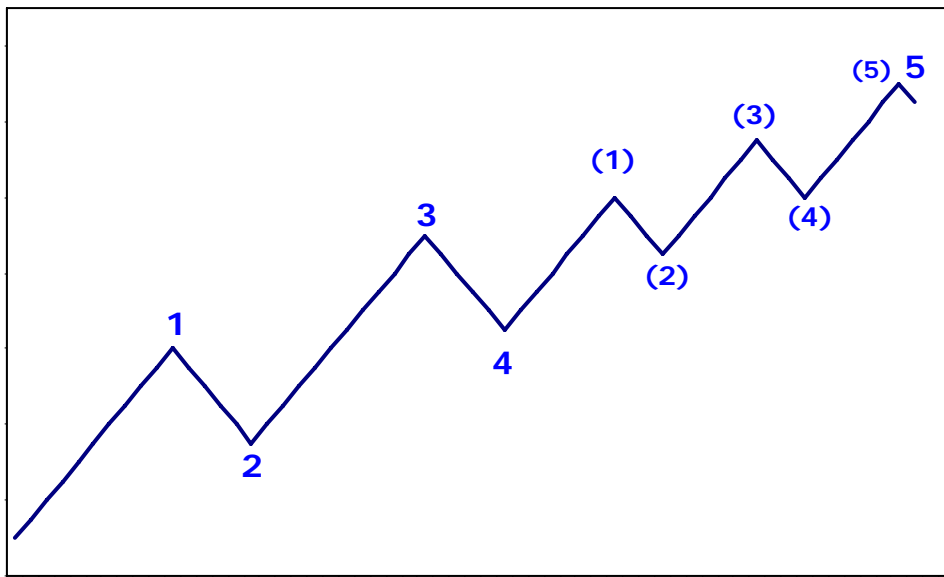
In fact, Elliot's "depth of corrective waves" hypothesis suggests that corrections, particularly 4th wave corrections, tend to stop within the span of movement of the previous 4th wave movement of one lesser degree. In other words, a 4th wave correction of primary degree should cease before it hits the trough established by the 4th wave movement of intermediate degree within the 3rd impulse wave.

The wave which is least likely to extend is the first impulse wave. This is due to the fact that the first impulse wave generally represents the weakest impulse movement. The subsequent corrective wave number 2 may, in fact, give back almost all of the movement on impulse wave number 1. Wave 5 is the second most likely or second least likely (depending upon your perspective) wave to extend. Elliot developed some interesting

guidelines which may be useful for forecasting how market movements may unfold subsequent to a fifth wave extension. In particular, a fifth wave extension is said to be retraced twice.

Assume you have reached a market top at the completion of the fifth wave of the fifth wave. The market is now expected to begin a three wave corrective phase. The first corrective wave a is expected to fall or retrace to the beginning of the extension. The second corrective wave b is thereupon expected to advance to the previously established market top or beyond before falling off as wave c is established. As such, the top of the fifth wave extension cannot represent the completion of the upswing as the market is likely to break down and then rally to the same level or possibly to a new high. As discussed below, this lettered phase takes the form of an irregular correction.

Extended Fifth Wave



As indicated earlier, impulse waves are normally expected to be approximately equal in magnitude (the magnitude of a movement may be measured in terms of volatility or vertical height and time or horizontal width). An extended wave is of greater magnitude than the two non-extending waves. In particular, it may be expected to be about 1.618 times greater in vertical height than the non-extending waves. (The number 1.618 comes from the Fibonacci number series.)

An extended wave tends to be perhaps 1.618 times the vertical height of non-extending waves. Note that the number 1.618 comes from the Fibonacci number series.

A "wedge" or "diagonal triangle" may be mistaken for an extension because this triangle is generally played out in a series of five waves. But unlike a fifth wave extension, this wedge may rise on reduced volume and volatility. *I.e.*, the market is becoming "exhausted." It has traveled a bit too sharply and must display a bit of a consolidative movement. Similar to a triangular correction (discussed below), this wedge breaks down into

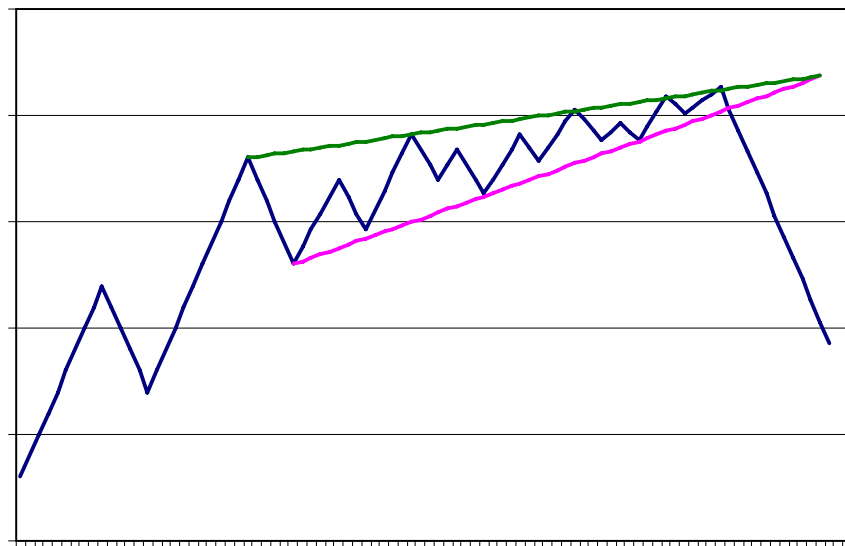
A wedge or diagonal triangle may be mistaken for an extension because it is played out in 5 waves. But it tends to feature reduced volume.

a 3-3-3-3-3 pattern or a series of five waves which break down into three smaller waves each.

A failure is a situation where a 5th impulse waves fails to clear the top of the 3rd impulse wave.

A "failure" represents an instance where the fifth impulse wave fails to clear the top of the third impulse wave. Many analysts may mistake this formation from a lettered corrective phase. But the fourth corrective wave and the subsequent fifth wave failure may be distinguished from the beginning of an a-b-c corrective phase. The distinction lies in the fact that this fifth impulse wave may break down into a series of five waves of smaller degree. It is, therefore, distinguished from wave b of an a-b-c correction in that wave B should break down into 3, rather than 5, smaller waves.

Diagonal Triangle or Wedge



Corrective waves may take on several different forms.

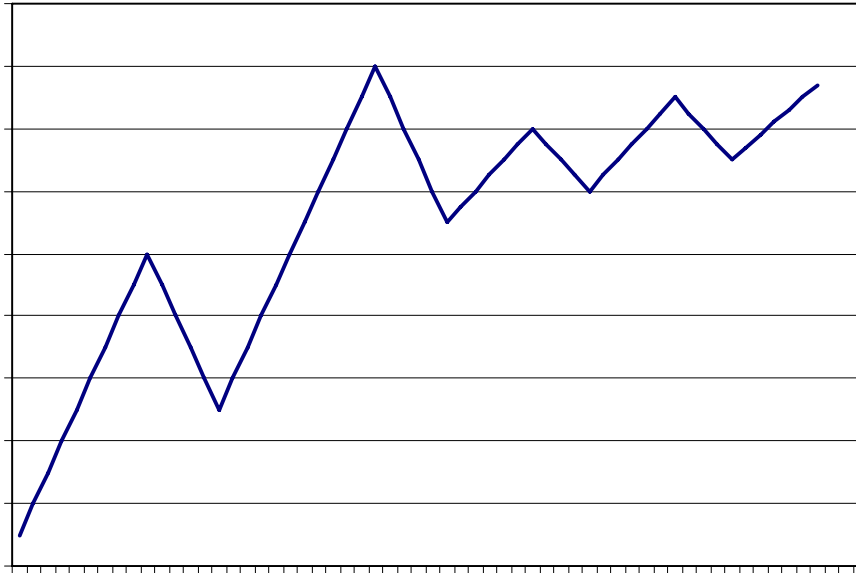
Corrective Waves - Just as impulse waves often take on alternate forms apart from the norm, the subsequent a-b-c lettered phase often takes on alternate forms as well. Let's illustrate the so-called "normal" correction and its variations. These variations may be referred to as "flats," "triangles," "double threes" and "triple threes." These issues are complicated further by the fact that there are several variations on the variations.

A normal a-b-c correction is sometimes referred to by its technical term: the zigzag.

The "normal" a-b-c correction is sometimes referred to by its technical term, the "zigzag." The normal zigzag is characterized in that its three waves break down into smaller waves with five, three and five movements, respectively. Notice that wave b of the normal zigzag does not rally above the peak established at the beginning of wave a (or the top of the previous fifth wave). Elliot suggests that, as a general rule, the vertical distance traveled by wave b tends to be about 61.8% of the

vertical distance of wave a. Waves a and c tend to be of about equal magnitude.

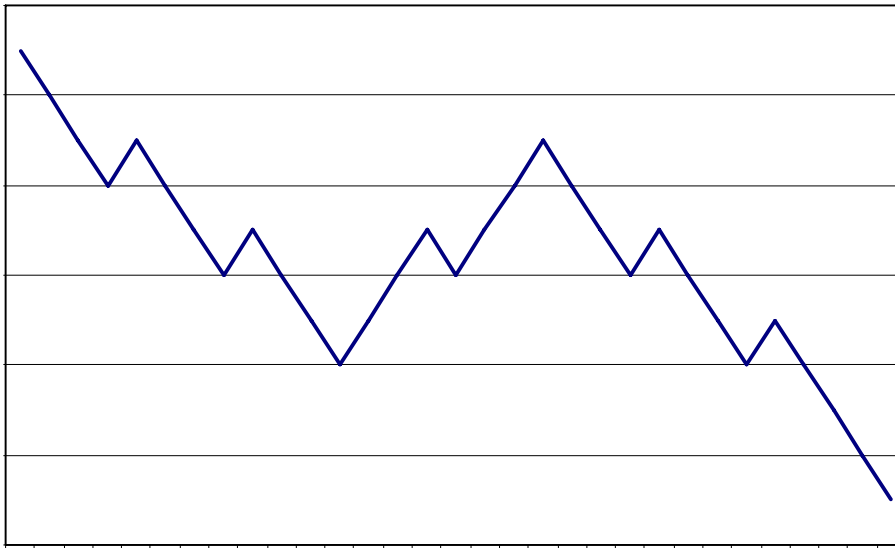
Fifth Wave Failure



This means that the zigzag carries the market into an area well below the top established at the beginning of wave a. But other kinds of corrections such as the "flats" cannot be expected to carry the market into quite so low areas. Whereas the zigzag is characterized as a "5-3-5" formation, the flat is characterized as a "3-3-5" formation, *i.e.*, three waves which break down into smaller movements of three, three and five waves, respectively.

While the three waves of a zigzag break down into 5s, 3s and 5s (5-3-5), the three waves of a normal flat correction break down into a 3-3-5 pattern.

Zigzag Correction

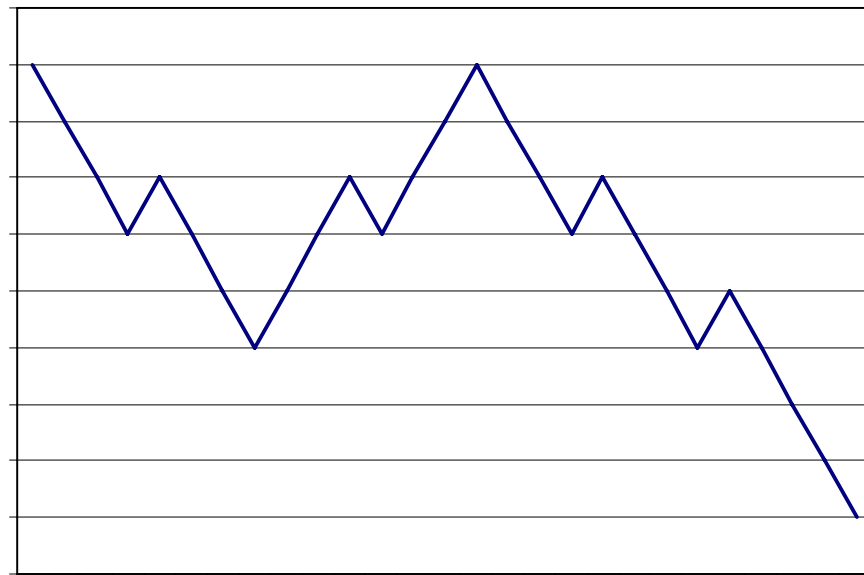


This breakdown suggests strength in the previous market trend. Strength is indicated in the fact that the first wave breaks down into only three,

rather than five, waves. The market's downward force during wave a is insufficient to create five waves.

In a "normal" flat, the subsequent upward wave b may fully retrace the movement of wave a. *I.e.*, the market may match its previous high established at the beginning of wave a or the conclusion of wave 5. Wave c thereupon drives the market to a point which is below the low established at the conclusion of wave a. But in addition to the "normal" flat, there are three other types of flats: the "irregular flat no. 1," "irregular flat no. 2" and the so-called "running correction."

Normal Flat Correction



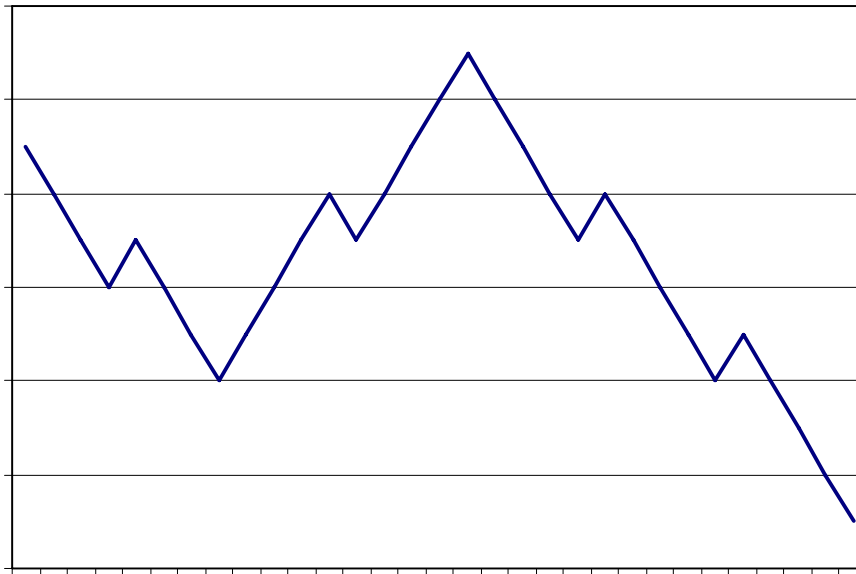
In an irregular flat correction No. 1, the b wave may retrace beyond the beginning of the previous a wave.

Pursuant to the irregular flat number 1, the market rallies not only to meet, but to exceed, the highs established at the beginning of wave a or the conclusion of wave 5. The subsequent third wave c falls below the low established at the conclusion of wave a. The irregular flat no. 1 indicates great strength insofar as wave b rallies over the previously established highs. But it also indicates volatility as the market trades in successively wider ranges with each wave.

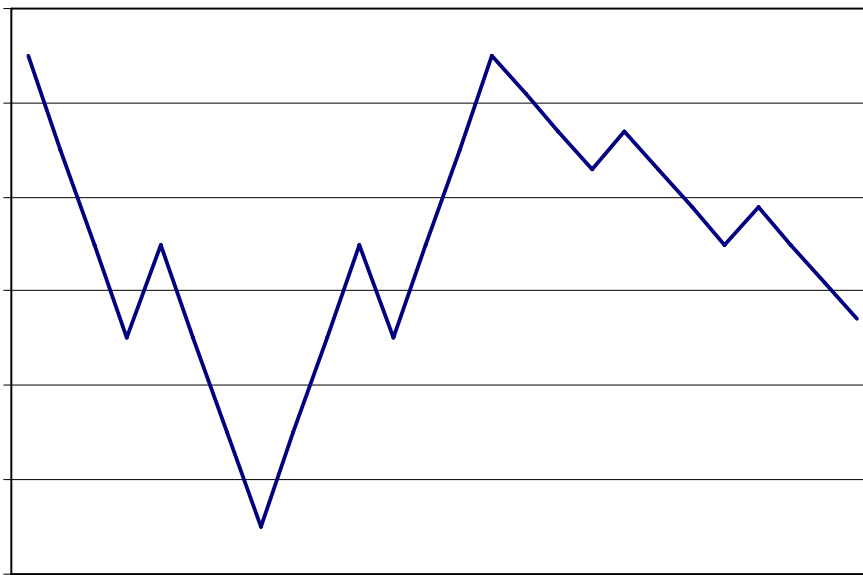
In an irregular flat correction No. 2, the c wave may fail to move beyond the beginning of the previous b wave.

Irregular flat no. 2 likewise shows strength but perhaps not such great strength as in irregular flat no. 1. This is observed insofar as wave b meets but does not typically exceed the top established at the beginning of wave a. The subsequent fifth wave c pushes the market down but not so far as to break the lows established at the bottom of wave a. In other words, the irregular flat no. 2 shows strength but volatility is falling, rather than rising.

Irregular Flat No. 1



Irregular Flat No. 2



Finally, a "running correction" is indicative of very great strength in the market. This is indicated in the fact that a running correction positively carries the market into new higher ground. In fact, wave c often concludes at a price level in excess of the top established at the beginning of wave a or conclusion of wave 5.

A running correction indicates great strength in the market as the b wave might advance above the beginning of the a wave. Further, the c wave may subsequently be supported by the top of the a wave.

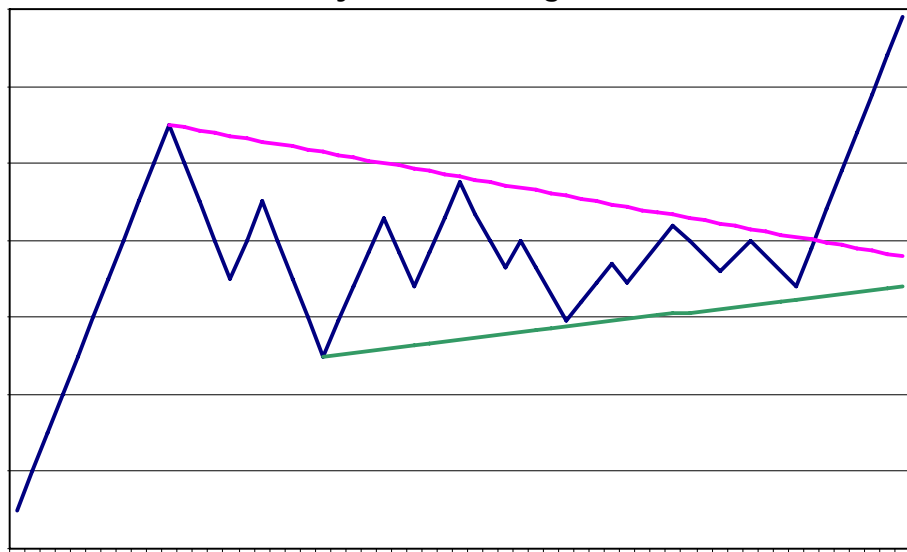
Running Correction



Corrections may also take the form of an ascending, descending, symmetrical and expanding triangles. These formations are similar to the classic pattern interpretations discussed above. However, per Elliot Wave Theory, the waves break into a series of 3s.

In addition to zigzags and flats, corrective phases may take on the form of a "triangle." Like the flat, a triangle can take on a number of forms (discussed in the context of "traditional" bar charting theory above). These forms include the "ascending," "descending," "symmetrical" and "expanding" triangles.

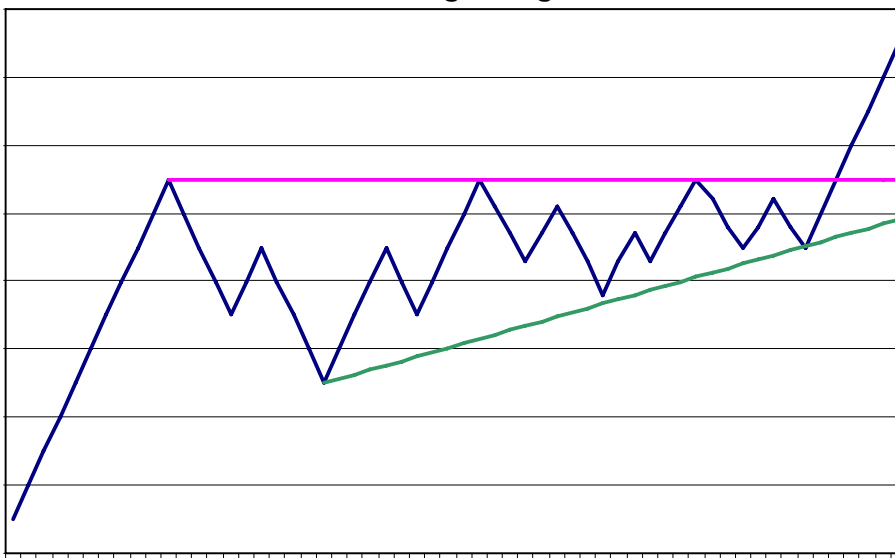
Symmetrical Triangle



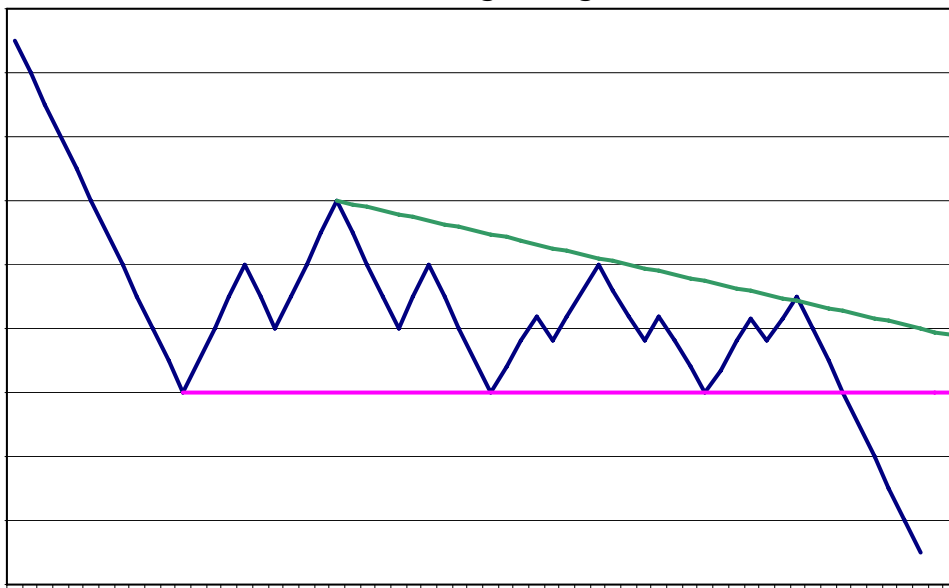
Elliot's interpretations of these triangles are quite similar to traditional interpretations discussed earlier. *I.e.*, triangles are continuation or corrective patterns. Ascending, descending and symmetrical triangles generally tend to be accompanied by falling volatility and volume while expanding triangles are accompanied by rising volatility and volume.

The break at the conclusion of an ascending, descending or symmetrical triangle is expected to be roughly equivalent to the width of the triangle at its widest point. Unlike traditional bar charting theory, Elliot's triangles are much more closely defined in terms of their pattern. All of these triangles are expected to break down into five waves (let's refer to these five as waves a, b, c, d and e).

Ascending Triangle



Descending Triangle

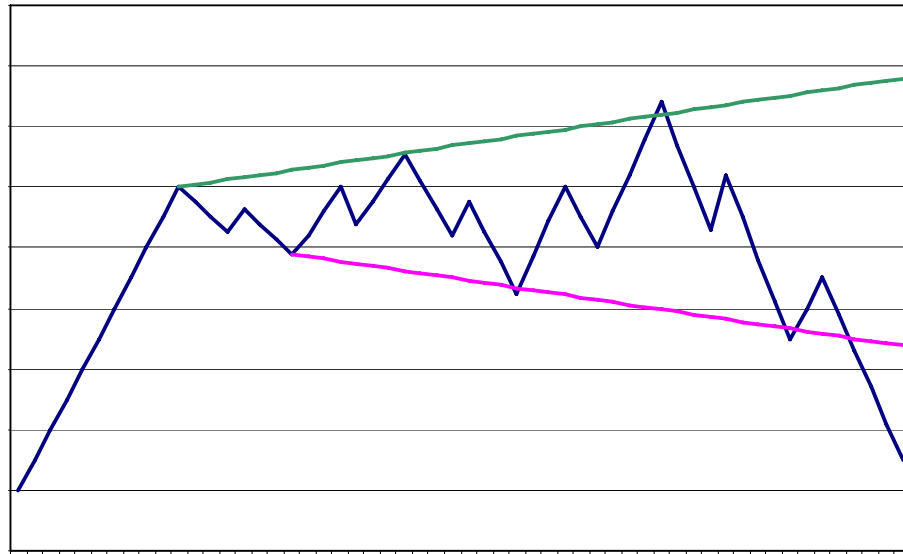


These five waves in turn break down into three smaller waves. In the ascending, descending and symmetrical triangles, the vertical height of each successive wave is expected to represent approximately 61.8% of the prior wave.

Sometimes corrective waves take on complex forms. For example, a double 3 or a triple 3 are comprised of zigzags or flats that run together. These forms are indicative of a market that is searching for direction.

Finally, Elliot indicates that a three-stage corrective phase may take on a more complex or compound form such as a "double 3" or a "triple 3." These formations may be thought of as two or three zigzags or flats strung together. They are strung together by a three step upswing referred to as "x." These formations indicate that the market needs an extended period of time to correct itself. Insofar as this formation is mostly horizontal, a double or triple three is a market which is searching for direction.

Expanding Triangle



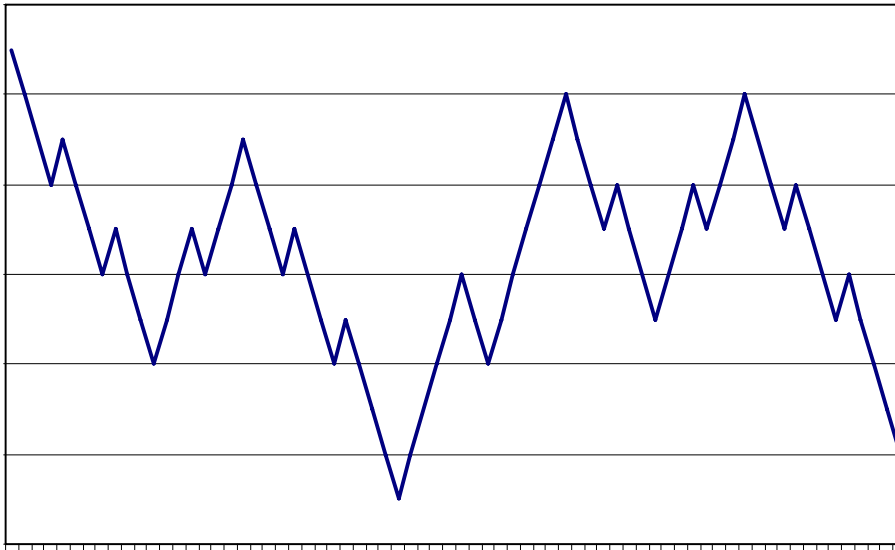
Elliot believed that patterns do not typically repeat. Thus, if the last correction was a flat, expect a zigzag or triangle during the subsequent correction.

Look for these patterns to be comprised of different types of corrective movements. For example, a double three may be comprised of a zigzag and some type of flat. Or, a triple three may be comprised of a zigzag and two different kinds of flats. Elliot believed that patterns do not repeat themselves successively. If the last correction (in wave 2 of a five step rally, for example) was a flat, expect the next correction (wave 4) to represent something other than a flat such as a zigzag or triangle. This "rule of alternation" applies with equal respect to the "threes" which make up a double or triple three in the lettered phase of a market movement as well as to the corrective waves in the numbered phase of the market.

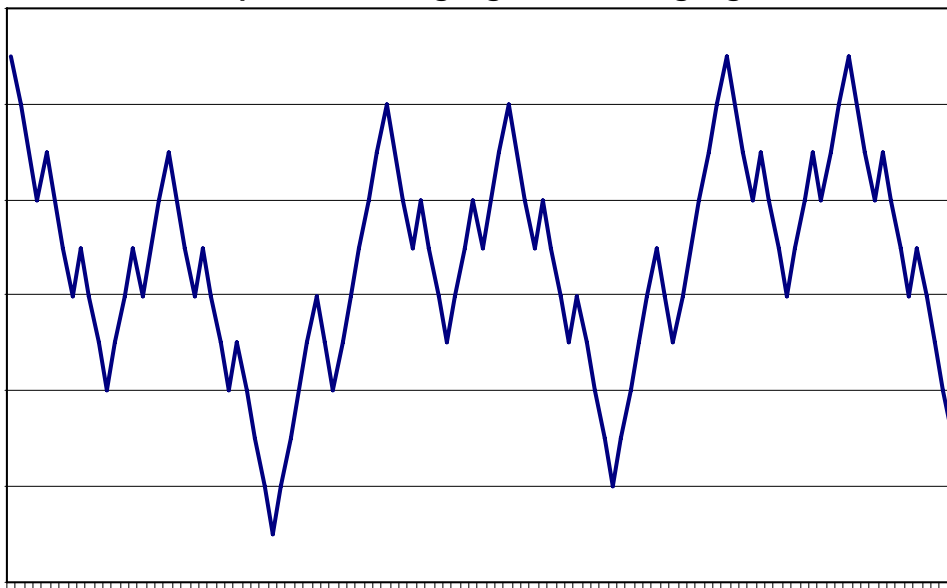
The type of correction observed gives an indication regarding the strength of the trend.

As suggested above, Elliot believed that the strength of a trend may be assessed, not so much by watching the trend itself, but by studying corrective patterns within the trend. The various corrective patterns discussed above all give rise to an interpretation with respect to the strength of the trend within the market.

Double Threes: Zizzag and Flat



Triple Threes: Zigzag, Flat and Zigzag



For example, a zigzag is indicative of normal strength in the market. The "normal" and the irregular flats indicate more strength in the market. The running correction is indicative of very great strength. Ascending, descending and symmetrical triangles indicate more strength than does the zigzag, culminating in a swift but relatively short-lived breakout. Double and triple threes show strength but of a tentative nature.

A zigzag indicates normal strength; a running correction indicates more strength; triangles indicate more strength than zigzags. Double and triple 3s are tentative.

Intra-Day Trading Techniques

There are a growing number of day traders who typically hold positions only during the course of a single day.

Point and figure charts are often used by day traders. They filter out spurious or insignificant price movements, allowing the trader to focus on what might be really important.

The point and figure chart is comprised of a series of Xs denoting upward movement Os denoting downward movement. The box size and reversal criteria are important.

Many analysts find that the charting techniques discussed above can be extremely useful for the purposes of inter-day trading. On an intra-day basis (within the same day), these techniques may be somewhat less useful. Some analysts, for example, do not make use of intra-day charts. If we believe that technical analysis works because it represents a "self-fulfilling prophecy," then it would be unwise to rely upon charting techniques which are not commonly referenced. As a result, analysts often rely upon other methods for purposes of intra-day trading. Some of these classic methods discussed here include point and figure charting and "pivot point" analysis.

Point and Figure Charting - Point and figure charting is a frequently referenced charting technique which may be used to plot price fluctuations on an inter- or intra-day basis. For our purposes, however, we will restrict our consideration to intra-day data. Point and figure charts are characterized by a series of "Xs" and "Os" arranged in columns. "Xs" represent price advances while "Os" represent price declines.

Point and figure charts are considered to be useful because, if properly constructed, they "filter-out" spurious price fluctuations. Because of the filtering mechanism intrinsic to the chart, it does not provide full information with respect to all (or at least small) fluctuations. Nor does it provide any information with respect to the time at which particular fluctuations took place.

Let's consider (1) how one might construct a point and figure chart; and (2) how to interpret the chart. One begins a point and figure chart with a piece of graph paper showing a series of columns and rows. The next and most critical step is to identify one's "box size" and "reversal" criterion.

The box size refers to the number of tics that is represented by each row. You may identify a box size from a single tic upwards. Assume that you were to plot T-note futures prices. One might designate a 2 tic box size, *e.g.*, each box represents 2/32nds or \$62.50. The reversal criteria refers to the number of boxes by which the market must reverse before a reversal is recognized and the chart changes from "Xs" to "Os" or vice versa. *I.e.*, the reversal criteria provides the filtering mechanism by which one discounts relatively small breaks in the trend. It is most common to designate a 3 box reversal criteria. If the box size is designated as 2 tics, this suggests that the market must reverse itself by a full 6 tics before such reversal is recognized.

How does one construct a point and figure chart? Begin by placing a dot in the box corresponding to the first price observed. Assume that the

market opens at 94-00 and begins to rally. As the market rallies in 2 tic increments, fill in successively higher boxes. But only if the market rallies by a full 2 tic box! Thus, if prices rise to 104-07, the highest box which is filled corresponds to 104-06. Only if the market rallies to 104-08 is the next highest box filled! Does a subsequent decline to 104- 01 constitute a reversal? No! Only if prices fall a full six tics or three boxes off the highest box filled in at 104-06 is a reversal recognized!

Now assume that the market falls all the way to 103-24. When the market hits 104-00, you move one column to the right and begin filling in "Os" down to 103-24. A subsequent rally back to 103-30 covers a full three boxes and, therefore, you move one column to the right and fill in a series of "Xs" up to 103-30. Another reversal takes the market in our example down to 103-22, indicated by a column of "Os." But the subsequent rally to 103-25 does not cover three full boxes. The market settles back to 103-22 but the rally to 104-05 constitutes a reversal. As soon as the market hit 103-28 on the way up, you move one column to the right and begin filling in "Xs."

To construct a point and figure chart, enter Xs to indicate upward movement by an amount equal to the box size you have decided upon. Enter Os to indicate downward movement. If the market reverses by an amount of the reversal criteria, start entering the opposite marks.

Constructing a Point and Figure Chart

104-00 → 104-07 → 104-01 → 104-06 → 103-24 →
 103-30 → 103-22 → 103-25 → 103-22 → 104-05 →

104-08				
104-06	X			
104-04	X	O		X
104-02	X	O		X
104-00	O			X
103-30	O	X		X
103-28	O	X	O	X
103-26	O	X	O	X
103-24	O		O	X
103-22			O	
103-20				

The simplest way of using a point and figure chart is to buy whenever you begin a new column of "Xs." Cover your longs and take a short position on a new column of "Os." As such, it is tremendously important to identify a workable box size and reversal criterion. This kind of trading system may work if the market exhibits clear trending tendencies. If, however, the market is quite choppy and reverses frequently, the system will result in a series of losses, albeit relatively modest losses on any given trade.

A simple technique is to buy whenever you begin a new column of Xs or short whenever you begin a new column of Os.

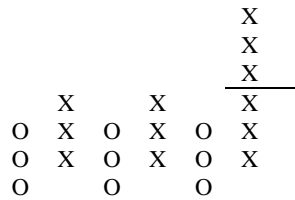
While the point and figure chart is sometimes used as indicated above, traders sometimes look for patterns in the charts just as you would look for patterns in a bar chart. Because this method filters out "spurious"

information automatically, patterns sometimes stand out much more clearly in a point and figure chart than in a bar chart.

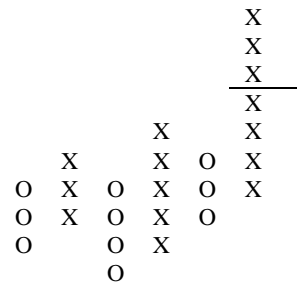
Just like with any charting technique, there are some commonly referenced chart patterns. These patterns are not dissimilar to the chart patterns discussed above.

Let's consider some of the more commonly recognized patterns. You will note that many of these point and figure patterns are reminiscent of the bar chart patterns discussed earlier. The patterns shown in the accompanying diagrams are restricted to buy signals. Sell signals may be generated by similar formations that are simply reversed, *i.e.*, invert these diagrams by rotating along a horizontal axis.

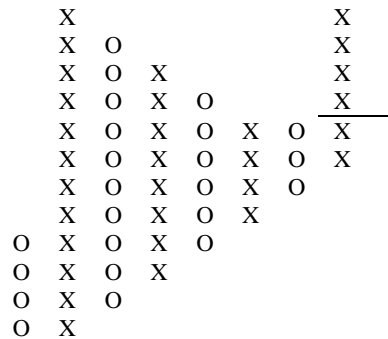
Break of Triple Top



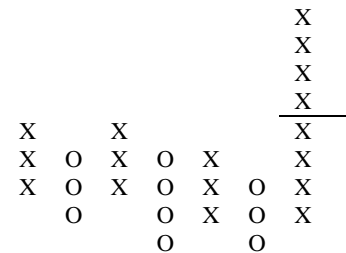
Ascending Triple Top



Symmetrical Triangle



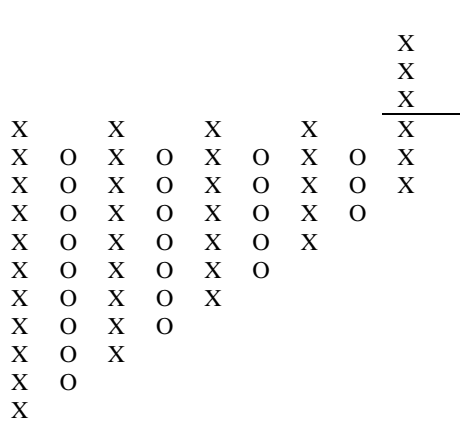
Spread Triple Top



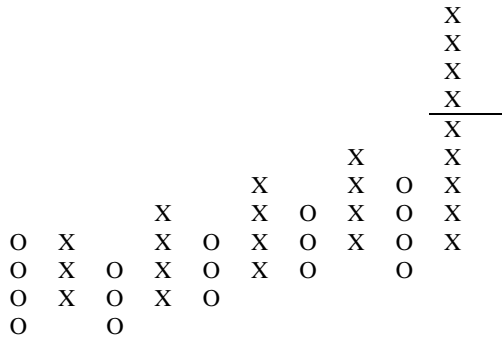
Count the number of columns over which the pattern formed for an indication of possible movement subsequent to a breakout.

Once the market breaks, how far can it be expected to move? One may get an indication for the expected movement by counting the number of columns over which the pattern formed. Look for the vertical market movement to equal the horizontal movement while the pattern formed.

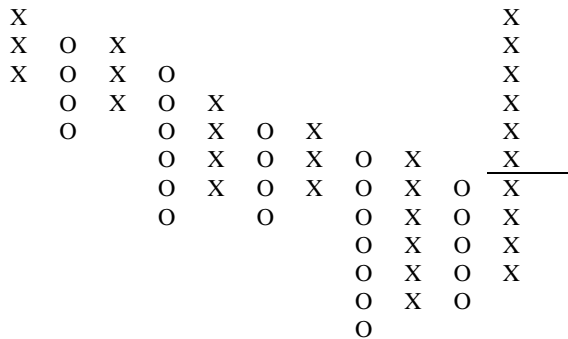
Ascending Triangle



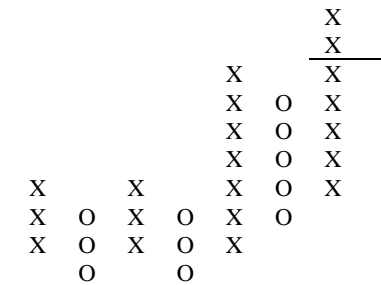
Bull Resistance



Bear Resistance



Catapult



Pivot Point Analysis – “Pivot point analysis” represents another technique which is frequently used on an intra-day basis. This method allows one to identify potential levels of support or resistance. It relies on high, low and closing price information from the preceding day. The central “pivot” may be calculated as the average of the high (H), low (L) and closing (C) price levels.

Pivot point analysis is often used on an intra-day basis. The central pivot is simply the average of the high, low and close of the day.

$$\text{Pivot} = (H+L+C) \div 3$$

Depending upon whether the market is above or below this pivot, it may act as either a support or resistance level. Other potential areas of support or resistance may be found with similar measures. In particular, one may calculate the “1st support” and the “1st resistance” levels; or, the “2nd support” and “2nd resistance” levels. Look for support or resistance on the following day at these levels on the next trading day.

We further identify 1st support and resistance levels; and, 2nd support and resistance levels to apply to market movements on the subsequent day.

$$\begin{aligned} \text{1st Support} &= (2 \times \text{Pivot}) - H \\ \text{1st Resistance} &= (2 \times \text{Pivot}) - L \\ \text{2nd Support} &= \text{Pivot} - (H - L) \\ \text{2nd Resistance} &= \text{Pivot} + (H - L) \end{aligned}$$

Example: On February 15, 2008, EuroFX futures for delivery in March 2008 settled at 1.4657 U.S. dollars per Euro. The low for the day was posted at 1.4654; the high at 1.4695. The pivot points may be calculated as follows:

$$\begin{aligned} \text{2nd Resistance} &= 1.4710 \\ \text{1st Resistance} &= 1.4683 \\ \text{Pivot Point} &= 1.4669 \\ \text{1st Support} &= 1.4642 \\ \text{2nd Support} &= 1.4628 \end{aligned}$$

Trend Following Systems

Trend following systems apply mathematical formulas to the market. Used in concert with oscillators, they represent common and useful technical tools.

Many (if not most) technical trading methods represent "trend-following" systems to one extent or another. In other words, they do not attempt to predict the advent of a new trend. Rather, they are intended to identify the existence of a trend and recommend action on the expectation of a continuation of the same. "Moving averages" represent some of the most common trend following devices. Used in combination with "oscillators," they provide some very interesting and potentially useful technical tools.

Moving averages are perhaps the most common of trend following tools. It is most common to take an average of closing prices. But some prefer to use pivot points.

Moving Averages - A moving average represents an average market price over a recent time period. Moving averages are constructed in order to identify "the trend" by filtering or "smoothing-out" unusual or temporary price aberrations. Two issues which must be addressed include: how should one calculate a moving average (MA); and, once constructed, how might one interpret the statistic?

There are many variations on a moving average calculation.

On the first pass, one might assume that there is a single, straightforward method of calculating a moving average. In actuality, however, there are a number of very different means by which one may construct an MA. In order to calculate a moving average, one must decide exactly what statistic you wish to average. For example, one may elect to take an average of a series of market opening prices, highs, lows or closes. Some analysts prefer to take an average based on the midpoint of the high/low range or on the "pivot" or the average of the high, low and closing prices. Most analysts, however, use the close or settlement prices.

There are also several different ways of calculating a moving average. These means include: (1) a simple or arithmetic average; (2) a geometric average; (3) a weighted or linear weighted average; and (4) an

exponentially weighted average. Let's consider each method in turn along with the advantages and disadvantages of each.

An arithmetic average simply refers to the kind of average with which we are all very familiar. *I.e.*, take the summation of a series of prices (P) divided by the number of observations (n).

An arithmetic average is the most common and simply represents the average price over the past n days.

$$MA = \sum_{i=0}^{n-1} (P_i) \div n$$

Example: Consider the following data series and construct a simple average of the data:

<i>i</i>	Day	Price
0	Wednesday	96.10
1	Tuesday	96.00
2	Monday	95.90

$$MA = (96.10 + 96.00 + 95.90) \div 3 = 96.00$$

A geometric moving average means that you take the nth root of the multiplicative sum of the numbers:

A geometric average is calculated as the nth root of the multiplicative sum of the numbers. But geometric averages tend to be downwardly biased.

$$MA = \sum_{i=0}^{n-1} (P_i)^{1/n}$$

Example: Find the geometric average of the number series illustrated above.

$$MA = (96.10 \times 96.00 \times 95.90)^{1/3} = 95.99$$

As is apparent, a geometric average tends to be "downwardly biased." *I.e.*, it consistently tends to understate the arithmetic average. A weighted average is intended to accord greater emphasis to more recent, as opposed to less recent, observations. The rationale is simply that recent observations provide information which may be more relevant to forthcoming price movements than "stale" or old observations.

$$MA = \sum_{i=0}^{n-1} (W_i \times P_i) \div \sum_{i=0}^{n-1} W_i$$

A weighted moving average can be used to impute more weight to recent as opposed to more distant observations. But some criticize this method as rather arbitrary.

The weights (W) in a scheme such as that which is illustrated above may be determined arbitrarily by the user.

Example: Let's arbitrarily establish weights of 10, 5 and 2 for the most recent and successively less recent observations.

<i>i</i>	Day	Price	Weight
0	Wednesday	96.10	10
1	Tuesday	96.00	5
2	Monday	95.90	2

Find the weighted moving average:

$$\begin{aligned}
 \text{MA} &= [(10 \times 96.10) + (5 \times 96.00) + (2 \times 95.90)] \div (10 + 5 + 2) \\
 &= 96.05
 \end{aligned}$$

A criticism of this method is that our weights are being established in a strictly arbitrary manner. Some analysts prefer to identify weights on a "linear" basis. This means that you weight the most recent price with a number corresponding to the number of observations (n). The next most recent observation is given a weight of n-1; the second most recent observation is given a weight of n-2, etc.

Example: Find the linear moving average for the price series shown above. This means that you will weight these prices with 3, 2 and 1 as depicted below.

<i>i</i>	Day	Price	Weight
0	Wednesday	96.10	3
1	Tuesday	96.00	2
2	Monday	95.90	1

Find the linear-weighted moving average:

$$\begin{aligned}
 \text{MA} &= [(3 \times 96.10) + (2 \times 96.00) + (1 \times 95.90)] \div (3 + 2 + 1) \\
 &= 96.03
 \end{aligned}$$

An exponentially weighted moving average is a variation on the weighted moving average.

Another weighting scheme is known as an "exponentially-weighted" moving average. This method provides weights which are graduated on an exponential basis as shown below.

$$MA = \sum_{i=0}^{n-1} [(1-a)^i \times P_i] \div \sum_{i=0}^{n-1} (1-a)^i$$

Where $0 < a < 1$

Example: Find the exponentially weighted moving average for the price series shown above. Set "a" equal to 0.5. This means that you will weight these prices with 1, 0.5 and 0.25, respectively.

<i>i</i>	Day	Price	$(1-0.5)^i$
0	Wednesday	96.10	1.00
1	Tuesday	96.00	0.50
2	Monday	95.90	0.25

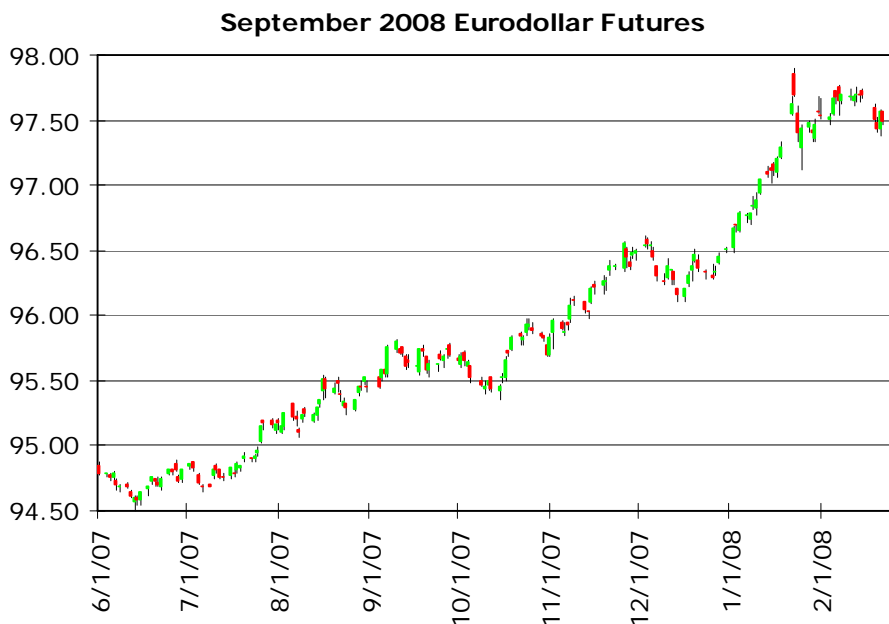
Find the exponentially-weighted moving average:

$$MA = [(1 \times 96.10) + (0.5 \times 96.00) + (0.25 \times 95.90)] \div (1 + 0.5 + 0.25)$$

$$= 96.04$$

Once calculated, what do you do with a moving average? Let's explore three different systems which may be used to trigger buy or sell orders in the futures markets. These systems include: (1) a double crossover; (2) a triple crossover; and (3) a double crossover system with bands.

There are many variations on moving average trading systems including a simple double crossover system, a triple crossover and a double crossover system with bands.



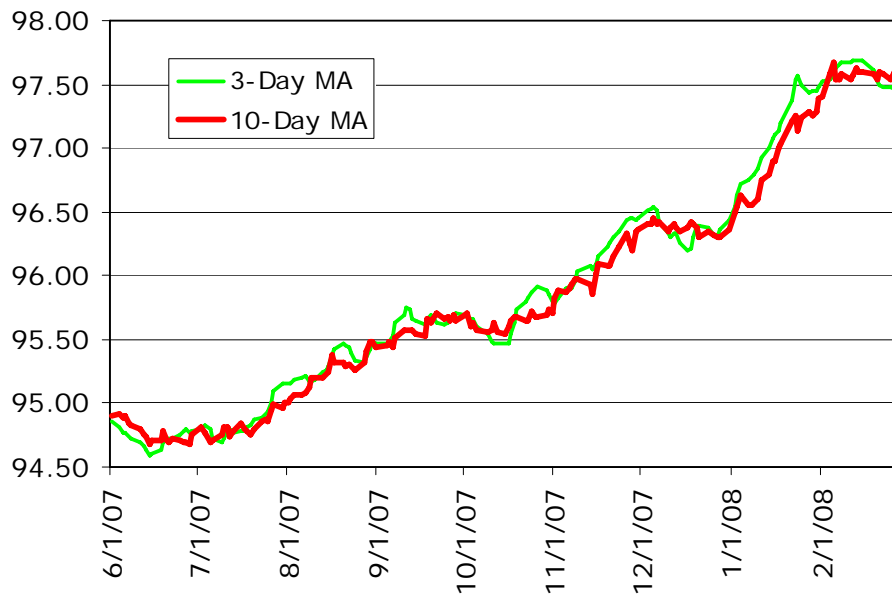
A double crossover system is quite straightforward. Simply calculate two moving averages including a "fast" moving average MA(f) incorporating a relatively small number of observations; and, a "slow" moving average MA(s) incorporating a relatively large number of observations. A fast

Trading signals are generated by a double crossover moving average systems when one the “fast” moving average moves through (or “crosses over”) the “slow” moving average.

MA will be more reactive to recent market movements relative to a slow moving average which may tend to "smooth-out" unusual or discrepant price movements. (The ultimate in "fast" moving averages is a one-day "mover.") How many observations should be used to construct a moving average? Enough observations such that the average is "representative" but not so many as to incorporate old "stale" data!

But a better answer is: calculate moving averages in such a way as to maximize your return given the trading system you wish to employ. You will only know this answer through the process of simulation over an historical time period. And, unfortunately, there is no guarantee that a particular system which produced good results over some past period will continue to produce profitable results.

Moving Averages: Sep-08 Eurodollar Futures



This system may trigger a buy or sell upon a "crossover." *I.e.*, when the fast MA crosses up over the slow MA, this may trigger the placement of a buy order (covering any existing short positions at the same time). Should the fast MA cross down below the slow MA then put in a sell order, covering any existing long positions.

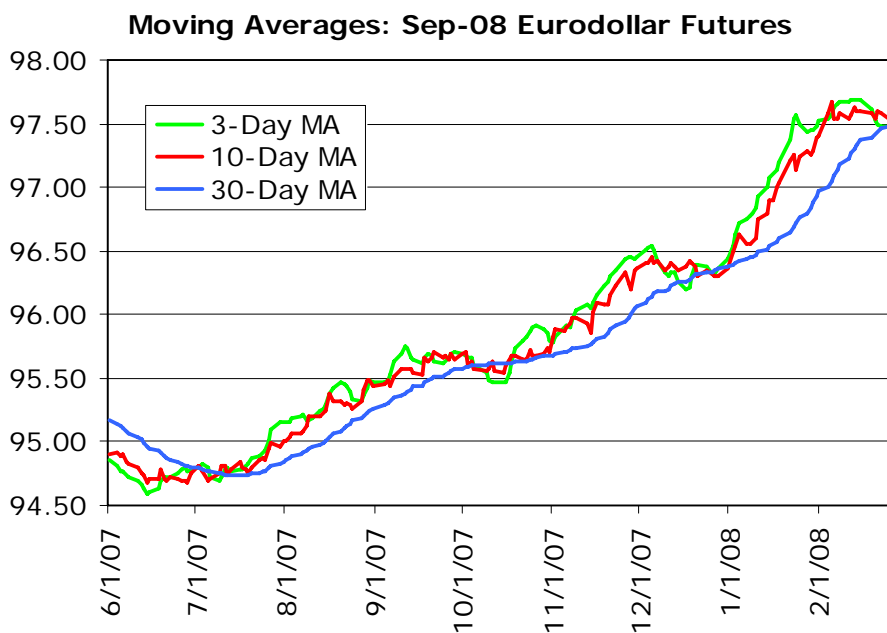
- If $MA(f) > MA(s) \rightarrow$ Cover any shorts and buy.
- If $MA(f) < MA(s) \rightarrow$ Cover any longs and sell.

This represents a trend following system. If the market is trending, you may expect large profits. But if the market is generally directionless or "choppy", you may expect to make a relatively large number of trades many of which may result in small losses. *I.e.*, you will suffer from "whipsaws."

Losses tend to be cut short to the extent that a sudden reversal may result in a crossover. But when the market is trending, the fast moving average may remain on the upside or the downside of the slow MA for a lengthy period of time. Thus, you tend to let your profits run. This is consistent with the old saying in the futures markets: "let your profits run and cut your losses short."

Moving average trading systems will hopefully produce a small number of large gains and a large number of small losses.

The triple moving average is intended to provide the benefits of the double moving average system while minimizing losses as a result of whipsaw markets. It does so by attempting to identify buy, sell as well as neutral situations (where the best advice is to stay out of the futures market altogether).



As its name implies, this system utilizes three different moving averages including a "fast" average MA(f), an "intermediate" average MA(i) and a "slow" average MA(s). When the fast mover breaks above both the intermediate and slow mover then buy futures. When the fast mover breaks below both the intermediate and the slow mover then sell futures. When the fast moving average is between the slow and intermediate averages then stay on the sidelines.

A triple moving average system suggests that one go long when the fast moving average rallies above both the intermediate and slow moving average; or, go short when the fast moving average falls below both the intermediate and slow moving average. If the fast moving average is between, go flat.

If $MA(f) > MA(i), MA(s) \rightarrow$ Buy futures

If $MA(f) < MA(i), MA(s) \rightarrow$ Sell futures

If $MA(f)$ between $MA(i)$ and $MA(s) \rightarrow$ Cover any longs or shorts

Another way of attempting to minimize whipsaws and to take advantage of "true" trends is to utilize a variation of the double crossover system: a double crossover with "volatility bands." This means that you will compare a fast moving average to a slow moving average plus or minus

A double moving average system with bands requires one to create band of plus or minus X above and below the slow moving average.

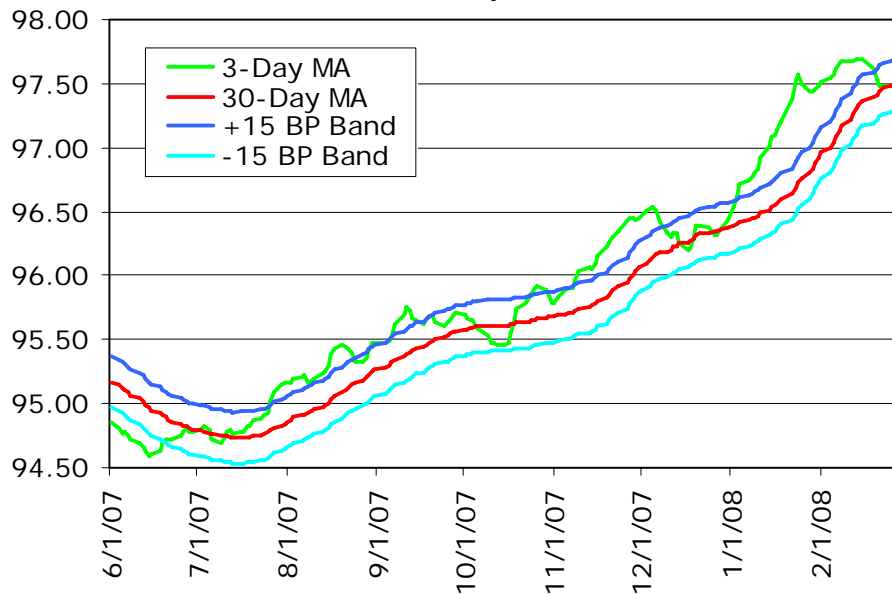
some "band." This band may be established at some fixed arbitrary amount. *E.g.*, take the slow moving average plus or minus 1 point.

Example: A moving average based on the last 20 days in the T-note futures market is at 104-24. Find an upper and lower band calculated as the 20-day MA plus or minus 1 point. Obviously, the upper band equals 105-24 while the lower band equals 103-24.

Sometimes it is expressed as a percentage of the value of the slow moving average. *E.g.*, take the slow moving average plus or minus 1%.

Example: A moving average based on the last 20 days in the EuroFX futures market is at 1.4660 U.S. dollars per Euro. Find an upper and lower band calculated as the 20-day MA plus or minus 1%. These levels equal 1.4807 on the upper side and 1.4513 on the lower side.

MA's with Bands: Sep-08 ED Futures



When the fast moving average crosses above the upper band, then go long. When the slow moving average crosses below the lower band, then go short. If the market is in between, go flat.

How can you use this system? The idea is to buy when the fast moving average crosses up over the upper band. Sell when the fast moving average crosses down below the lower band. Cover any longs or shorts and remain neutral if the fast moving average falls between the upper and lower bands.

If $MA(f) > MA(s) + \text{band}$ → Buy futures

If $MA(f) < MA(s) - \text{band}$ → Sell futures

If $MA(s) - \text{band} < MA(f) < MA(s) + \text{band}$ → Cover any longs or shorts.

Sometimes the system is used such that you cover any existing long position when the fast moving average crosses down below the slow moving average itself (rather than the slow moving average plus the band). And, cover any existing short position when the fast moving average crosses up above the slow moving average (rather than the slow moving average less the band).

Which of these systems is best? Obviously, the answer to this question will vary from market to market. Moreover, different systems will produce different results over various time frames. The best answer is: simulate results using historical data and employ the system which seems to produce the most profitable and stable results over time.

Oscillators - Moving averages are quite useful in determining the direction of the trend. But sometimes, the trend moves "too far, too fast." If the market has rallied strongly, it may be "overbought." If the market has been declining sharply, it may be "oversold." In these cases, a consolidation, correction or even a reversal becomes imminent. Oscillators represent statistics which may be used to identify these situations.

Oscillators may be used in conjunction with a way of thinking about the markets which is referred to as the school of "contrary opinion." The basic premise associated with contrary opinion: when everyone is bullish then sell. The corollary when everyone is bearish is to buy. But this seems to contradict the idea that a trend, once in motion, tends to stay in motion. But let's consider two hypotheses which may explain the psychology of a trend in motion. In particular: (1) market participants; and (2) the "strong hands" theory.

There are three basic kinds of traders in the market: longs, shorts and uncommitted. Assume the market is trending upwards. In order to continue that trend, new participants must continue to enter the market on the long side. Likewise, new participants must continue to sell in order to sustain a bearish trend. In either case, these new long or short positions will tend to drain the pool of uncommitted traders. When most or all of the uncommitted traders have committed themselves, there are no more traders to continue to push the market one way or the other. Finally, the bullish trend cannot be sustained and the market cracks. Or, the bearish trend halts and the market rallies.

Further, let's consider which side of the market has the stronger position in a bullish or bearish trend. Assume that 90% of all market participants are bullish and that only 10% of the participants are bearish. This suggests that for every 9 traders who are long, only a single trader is short. *I.e.*, the shorts must have larger size positions than the longs.

Moving averages are useful for trading the trend. But sometimes, the market goes too far in a particular direction and becomes "overbought" or "oversold." Thus, a correction may become imminent.

Oscillators are useful tools for identifying overbought or oversold conditions.

The “strong hands” theory is key to understanding why an oscillator may work. If most market participants are committed one way or the other, there may not be enough new market participants to sustain a previous trend.

Who has the stronger hand? If the shorts have been able to "fade" the market up so far, sustaining losses all the way up, they probably have the stronger hand. When the first of those longs decides to take his profit, the market cracks. Other longs, noticing that the market is falling, may start to take their profits as well. Soon, open interest starts to fall dramatically and the market falls quickly. Sometimes, the market may decline quickly in a panic sell situation.

How can you statistically assess whether the market is in an overbought or oversold condition? Let's review a variety of statistics such as (1) momentum; (2) double moving averages; and (3) the relative strength index.

Momentum is the simplest of oscillator systems and represents the change in price over a particular time lag.

Momentum refers simply to the change in the price of the instrument in question (P) over some arbitrary time period. Momentum may represent a 1-day lag, a 2-day, 3-day, 5-, 10-, 30- day lag. Or, any other period deemed appropriate.

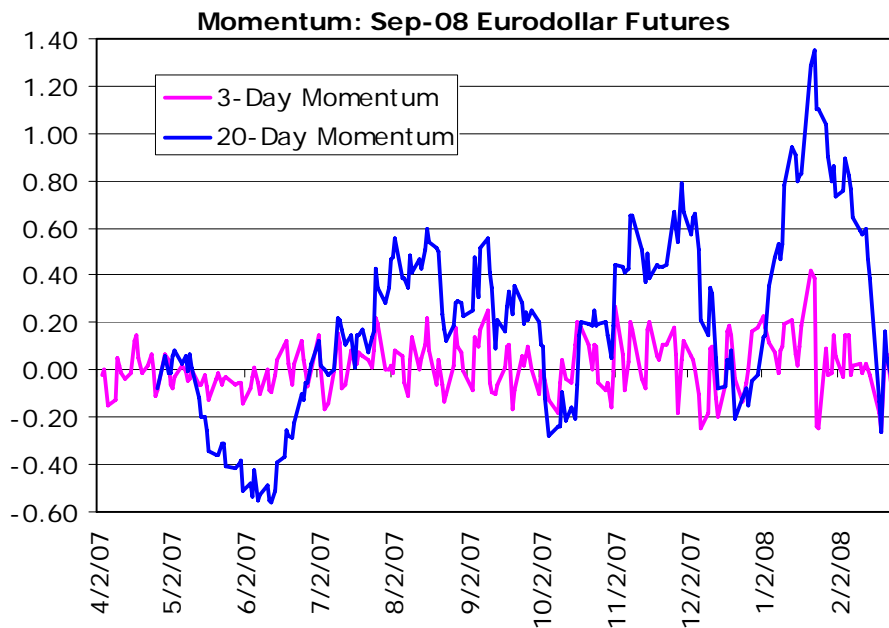
$$\text{Momentum} = P_t - P_{t-1}$$

Example: Today's note price is at 109-17. Yesterday, the market was at 109-10. A one-day momentum may be calculated at positive 7 tics. Assume that the market was at 106-29 ten days ago. The ten-day momentum may be calculated at 2-20/32nds.

There is a tradeoff with respect to the lag. The longer the lag you select, the less the degree to which the statistic is unduly impacted upon by extraneous or spurious movements. The shorter the lag, the greater the degree to which the statistic is affected by fresh, current data.

When momentum becomes “too high” or “too low,” the market may be considered overbought or oversold.

Does momentum exceed zero or fall short of zero? *I.e.*, is the market trending upwards or downwards? If momentum is above zero and rising, this suggests that the market advance is accelerating. If momentum is above zero but flat, then the market is rising at a stable rate. If momentum is above zero but falling, then the market is rising at a declining rate. Likewise, acceleration or deceleration may be observed in a falling market.



One of the unfortunate aspects about the use of the momentum statistic is that it tends to be "choppy." Particularly when using a short lag. Double moving averages tend to "smooth-out" extraneous, choppy movements by comparing a fast moving average to a slow moving average.

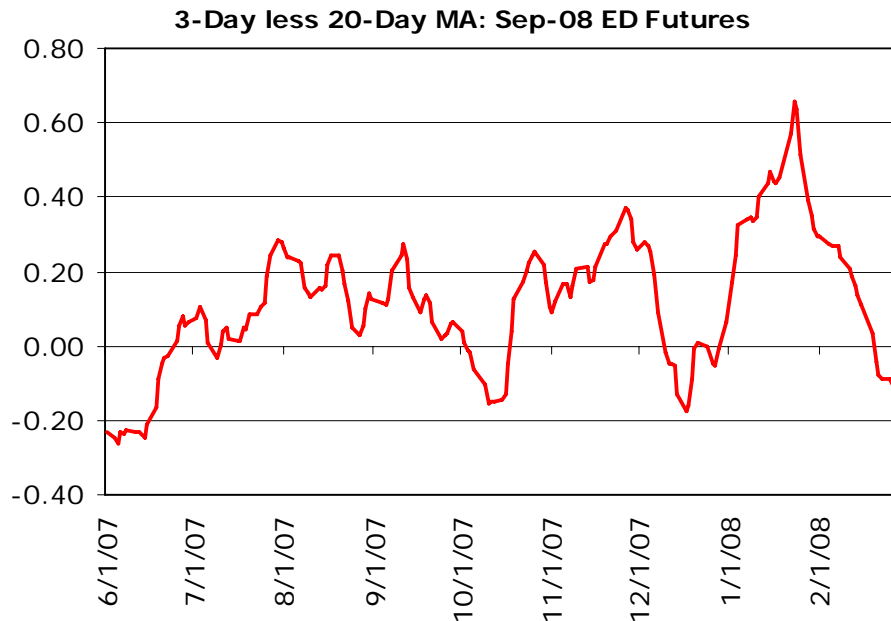
$$\text{Double MA} = \text{MA}(f) - \text{MA}(s)$$

Example: A 3-day moving average of the T-note futures price is quoted at 109-04. A 20-day moving average is quoted at 109-14. The 3/20 double moving average is quoted at negative 10 tics.

The unfortunate aspect about the application of either a momentum or a double moving average statistic is that there is often difficulty in recognizing the "danger zone." *I.e.*, how high does must the statistic be in order to trigger an "overbought" signal? How low must the statistic be to trigger an "oversold" signal?

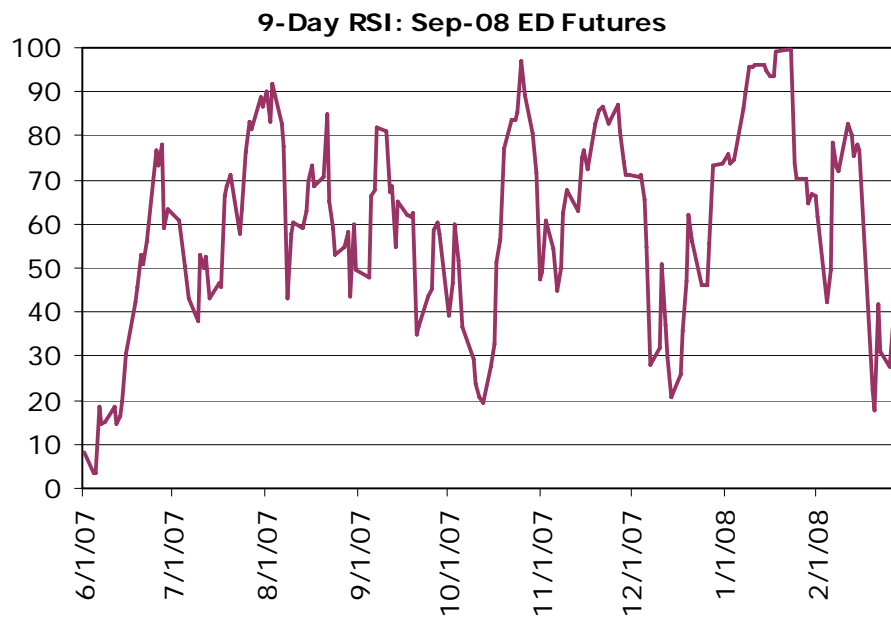
Momentum is often quite choppy. But you can smooth it out by simply referencing the difference between a fast and a slow moving average.

But how high or how low does the double moving average have to go before the market may be considered overbought or oversold?



The Relative Strength Index (RSI) was invented by Welles Wilder and is perhaps the most commonly referenced oscillator available. RSI falls between 0 and 100. If RSI exceeds perhaps 70 or 80, the market might be considered overbought. If RSI falls below perhaps 30 or 20, the market might be considered oversold.

The relative strength index (RSI) was developed by a technician named Welles Wilder and is intended to provide a consistent overbought or oversold indicator. The statistic must range between 0 and 100. Wilder's original work suggested that when the statistic meets or exceeds 70, an overbought condition is indicated and the market may consolidate or reverse. Or, if the statistic runs to 30 or below, an oversold condition is indicated.



$$RSI = 100 - [100 / (1 + Up/Down)]$$

Where:

Up = Sum of price advances over past n days.
 Down = Sum of price declines over past n days.

Example: Find a nine-day RSI for Eurodollar futures given the data below. This RSI of 54.54 is relatively close to 50.00. As such, neither an overbought or oversold condition is indicated.

Day	Price	Change
t	96.22	+0.02
t-1	96.20	+0.10
t-2	96.10	+0.04
t-3	96.06	+0.17
t-4	95.89	-0.28
t-5	96.17	-0.01
t-6	96.18	+0.15
t-7	96.03	-0.04
t-8	96.07	-0.07
t-9	96.14	

$$Up = 0.02 + 0.10 + 0.04 + 0.17 + 0.15 = 0.48$$

$$Down = 0.28 + 0.01 + 0.04 + 0.07 = 0.40$$

$$RSI = 100 - [100 \div (1 + (0.48/0.40))] = 54.54$$

Often when using an RSI with relatively few observations, it may be best to liberalize one's definitions of what constitute overbought and oversold conditions. Rather than 30 and 70, look for 25 and 75; or, 20 and 80. Sometimes when the market is about to reverse, the RSI penetrates the danger levels significantly, backs off and then penetrates the danger levels once again. This second penetration may or may not be as extreme as the first. It is often only after this second violation that the market reverses. This is intuitive in the sense that the market often trades in a reversal formation, or a sideways holding pattern, before reversing. The RSI may achieve an extreme level when initially entering the reversal pattern. Subsequently, the RSI may fall off of those extreme levels and penetrate the danger levels again just prior to completing the reversal pattern.