ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

Trend modelling: ***Graphical methods for a "trend follower" investment strategy***

(technical analysis)

Andrea Guizzardi
Department of Statistical Sciences
University of Bologna

Sources:

Robert D . Edwards "Technical Analysis of Stock Trends", Ninth Edition
(pp. 1-12; 56-68; 99-105; 129-144; 190-198; 211-239; 253-270; 451-466)
http://www.investopedia.com/

What is technical analysis?

Prices summarize everything…

The reason to look at technical analysis are usually resummarized in the following basic theoretical statements.

1. The market value of a security is determined solely by the interaction of supply and demand.
2. Supply and demand are governed at any given moment by many hundreds of factors, some rational and some irrational. Information, opinions, moods, guesses (shrewd or otherwise) as to the future combine with blind necessities in this equation. No ordinary man can hope to grasp and weigh them all, but the market does this automatically.
3. Disregarding Minor Fluctuations, prices move in trends that persist for an appreciable length of time.
4. Changes in trend, which represent an important shift in the balance between supply and demand, however caused, are detectable *sooner or later* in the action of the market itself.

What is technical analysis?

What can (and what can not) do technical analysis

it allows to formalize operational strategies according to predeterminated input;

it provides “usefull” information about the past;

it helps in building future scenarios about the dynamics of prices.

It Does NOT answer the question:

"where the price will be in the future?".

Infact the output of technical analysis are alternative scenarios and trading signals. allowing you to **follow the markets** and not to predict their future performance.

A different (subjective) probability is allocated to different scenarios as a function of graphical patterns - explicative of price's trend - and/or according to the value assumed by indices or indicators (quantitative analysis technique).

Ultimately technical analysis is an attempt to "rationalize" the investment behavior through observation of past dynamics.

Time, Volume and Market Breadth

the “quality” aspect of price trends

Time: reflects the "kinetic energy" of price’s trends.
Technicians give a different "weight" to market value dynamics of financial assets depending on the fact that the "new" price level is reached in a minute, in a day or in a month.
It is generally believed that, for the same price change, slower movements are a symptom of an underlying trend more stable and long-term lasting.
The noise component usually produces a strong variation of the "slope" in the price graphical representation. "Rumors“, with or without foundation, that become of public domain, have the power to excite or depress a stock, a sector or even an entire nation (Russia, Japan and Argentina just to mention some known examples).
These sudden excesses, whatever their underlying cause, are the subject of careful study in technical analysis as they are often a tangible signal of an upcoming trend inversion.
Infact the trends that persist for a long time are often closed by these "rush" that have the effect to tempt investors, with little experience, to enter/exit the market.

Time, Volume and Market Breadth

the “quality” aspect of price trends

Volume: represents the number of "pieces of financial activity" traded in a certain period of time. Measure "potential energy" that accompanies the movement of prices thus contributing to make understand the importance of a change in the prices.

Market breadth: the number of companies advancing, relative to the number declining. Positive market breadth occurs when more companies are moving higher than are moving lower, and it is used to suggest that the bulls are in control of the momentum

The idea is that when the growth or contraction in prices, concern only a small number of leading securities, the indication is a weak trend that probably will not be long lasting.

- It is measured by the percentage of stocks that have advanced in price or are showing a positive momentum over a defined period **(diffusion index)**

Measure the trend's quality
(Confirmation principle)

Confirmation referes to the occurrence of two or more indicators corresponding with one another and thereby corroborating the trend scenarios used to trade.

Traders look to different technical indicators to confirm their expected prediction so that they can have as many technical factors working in their favor as possible. This increases the probability of making a highly successful trade reducing false moves and premature breakout

Among more important technical indicators

- **Volumes** *(seen)* → Trend's "Potential energy"
- **Oscillator** → Trend's "Kinetic energy"

These measures are complementary to trends' extraction techniques (graphical or quantitative).

A technical analyst should therefore **NOT** base trading strategies **ONLY** on the information obtained by volume or the oscillators.

Working with technical analysis requires:

- Technical knowledge
  - Knowledge of the trading tools
  - Formalization of an operational strategy

But also….

- Work on a personal level
  - Rationalize the objectives
  - Knowing yourself (be able to control the emotions and to respond positively to negative stimuli)

The course will focus on the former.

Work on a personal level…

Optional readings

Some basic input of graphical analysis

The choice of the time frame (X axis)

The unit used to represent (in the X axis) the trend of prices is depending on the objective of the analysis and therefore, on the time horizon of the trading strategy
In general investors will be more interested in representing long-term dynamics, while speculators put more attention to the dynamics of very short period. The typical unit of representation are:

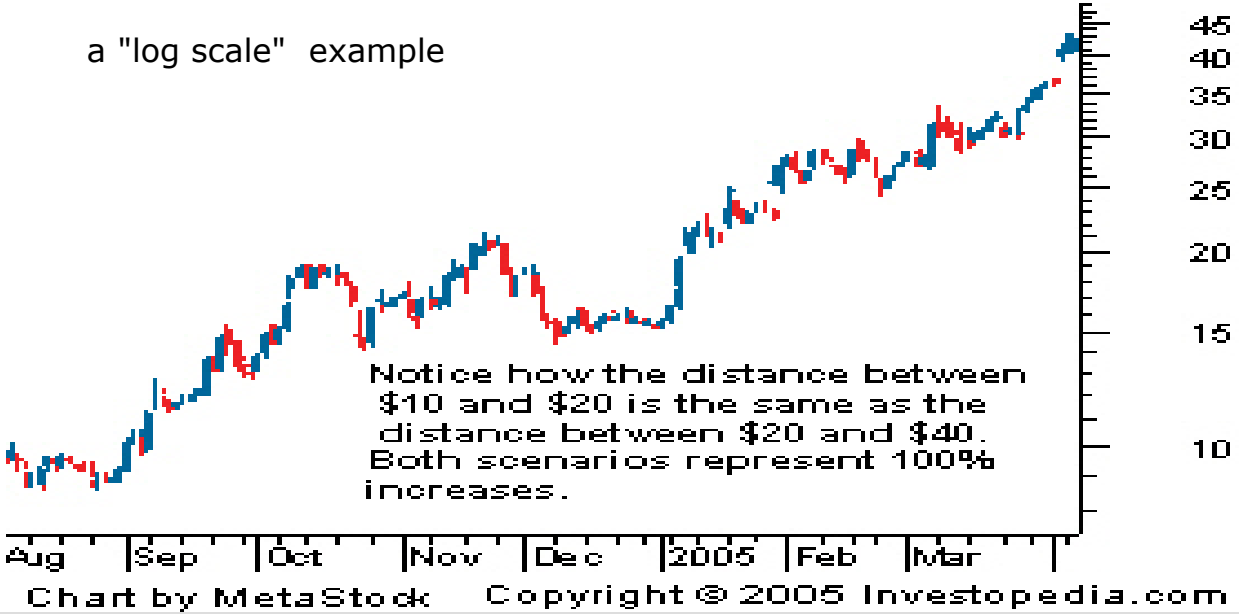
1. monthly/weekly to represent a time considered "long",
2. weekly/daily to represent a time considered “medium",
3. daily/intra-day (on an hourly frequency or even less), to represent a time frame considered "short",

Some basic input of graphical analysis

The choice of the price scale (Y axis): Linear vs (semi)Logarithmic Scale

Linear: chart is plotted in such a way that each unit change is represented by the same vertical distance on the chart, regardless of what price level the asset is at when the change occurs.

(semi)Logarithmic: chart is plotted in such a way that two equivalent percent changes are represented by the same vertical distance on the scale, regardless of what the price of the asset is when the change occurs. The distance between the numbers on the scale decreases as the price of the underlying asset increases.



Some basic input of graphical analysis

Price representation: Candlestick chart

A chart that simultaneously plots high, low, opening and closing prices for a security.

The wide part of the candle(stick) is called the **"real body"** and tells investors whether the closing price was higher or lower than the opening price (black/red if the stock closed lower, white/green if the stock closed higher).
The highest and lowest prices at which a security has traded over a specific time period is illustrated by a small line found on candle's top/bottom (**shadow**). Shadows show the day's high and lows and how they compare to the open and close.

Some basic input of graphical analysis

Price representation: Bar chart

A style of chart using **vertical lines where the top indicates the highest price a security traded at during a time frame, and the bottom represents the lowest price. The closing price is displayed on the right side of the bar, and the opening price is shown on the left side of the bar.**

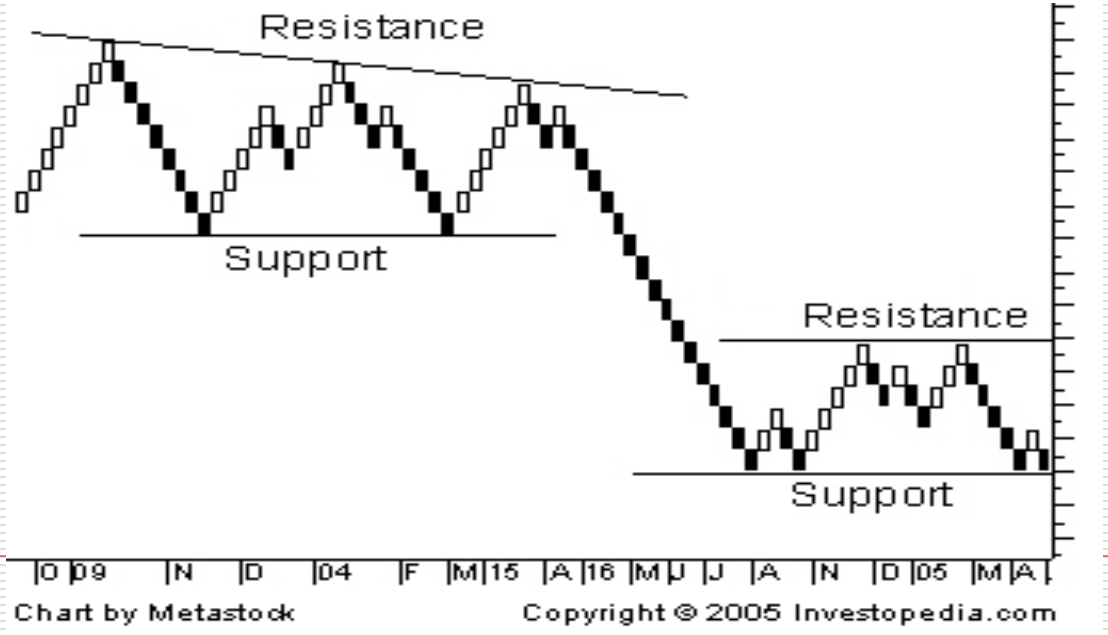
A single bar like the one beside represents one time frame trading.

Some basic input of graphical analysis

Price representation: Renko chart

A type of chart where **time and volume are not included**. Is constructed by placing a brick in the next column once the price surpasses the top or bottom of the previous brick by a predefined amount. White bricks are used when the direction of the trend is up, while black bricks are used when the trend is down.

This type of chart is very effective for traders to identify key support/resistance levels. Transaction signals are generated when the direction of the trend changes and the bricks alternate colors

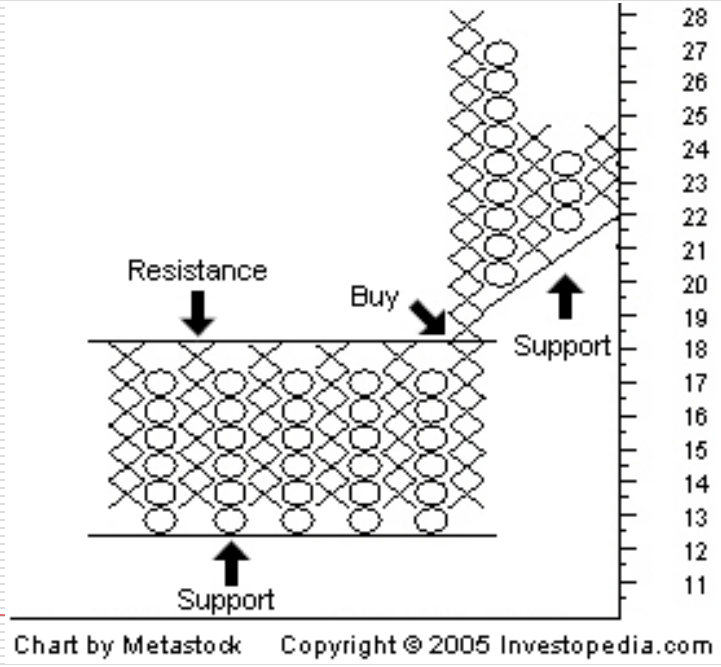


Some basic input of graphical analysis

Price representation: Point & Figure chart

A chart that plots day-to-day price movements without taking into consideration the passage of time. Point and figure charts are composed of a number of columns that either consist of a series of stacked X's or O's. A column of X's is used to illustrate a rising price, while O's represent a falling price. This type of chart is used to filter out non-significant price movements, and enables the trader to easily determine critical support and resistance levels.

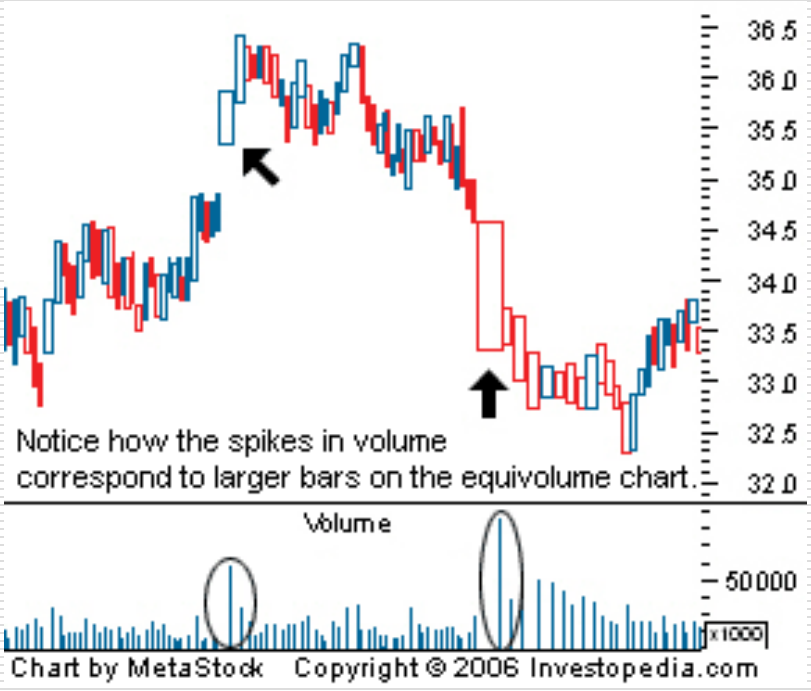
Each chart has two setting parameters.
The first defines the price range for drawing a symbol.
The second determine the amount that a stock needs to move in the opposite direction to warrant a column reversal.
Whenever this reversal threshold is crossed, a new column is started right next to the previous one, only moving in the opposite direction.



Some basic input of graphical analysis

Price representation: Equivolume chart

A chart that compares price and volume and plots them together as one piece of data. The width of each bar represents the volume relative to the total shares traded



Trend extraction with graphical approach

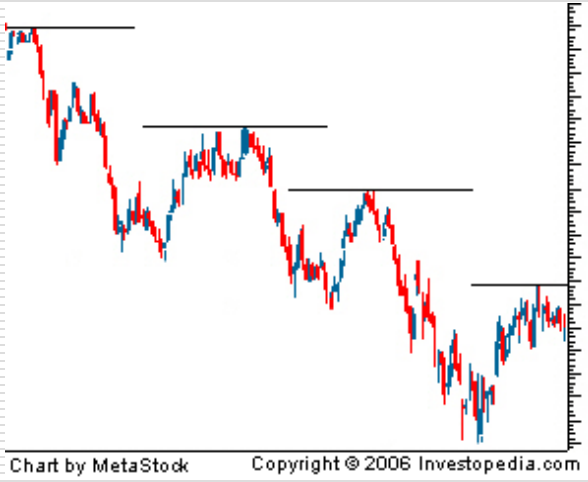
Sequence of local maxima and minima (descending tops / rising bottoms)

A simple technique used to "follow" the trend is the analysis of the sequences min-max, derived from the original observations of Charles Dow,

A rising market evolves according to a series of waves, in which a series of minimum/maximum are higher than have gone before them.

At a time when this sequence of maxima and minima ends,
(at some time, one of the new relative maxima fails to overcome the previous and the next minimum falls below the previous low), technical analysts observe a trend reversal.

The importance of a reversal minimum-maximum is related to the length and magnitude of price movement in question:
the longer it takes to interrupt the min/max sequence
the more “important” is trend reversal.



Trend extraction with graphical approach

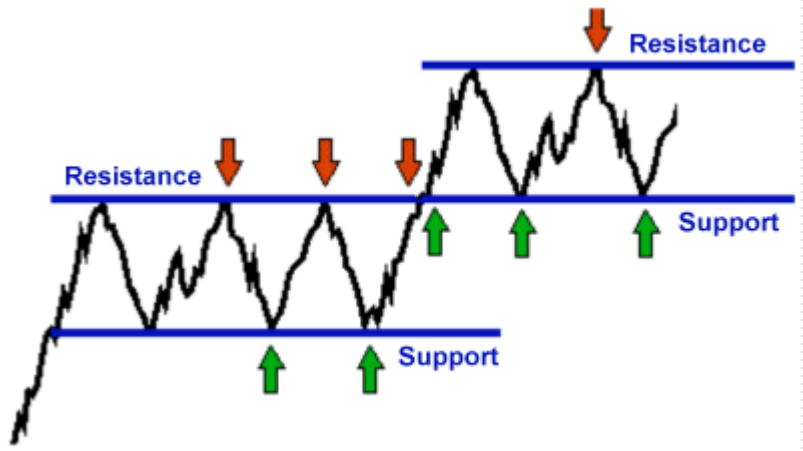
Support and Resistance

- A **support level** is a price level (or a range) where the price tends to find support as it is going down. This means the price is more likely to "bounce" off this level rather than break through it.
- A **resistance level** is the opposite of a support level. It is where the price tends to find resistance as it is going up. This means the price is more likely to "bounce" off this level rather than break through it.

- Practitioners drown support and resistence on historical price's graphs in order to build probalized scenarios on future trends and build investment strategies.
- Once the price has passed a resistence (or a support), by an amount exceeding some noise, **it is likely that it will continue** rising (dropping) until it finds another resistance (support) level.
- Traders will place orders when the price moves beyond identified support/resistance levels.

Support and resistance
(graphical approach)

SUPPORT: The support level (or the area of support) is a price level which, historically, a stock has had difficulty falling below. It is thought of as the level at which a lot of buyers tend to enter the stock.



RESISTENCE: An area of resistance or resistance level indicates that the stock or index is finding it difficult to break through it, and may head lower in the near term.

Support and resistance: the explanation

(from "Technical Analysis of Stock Trends")

"… Imagine yourself, for the moment, in the place of new owners buying a stock at 50. They see prices turn up, reach 55, 58, 60. Their judgment appears to have been vindicated. They hang on. Then the rally peters out, and prices start to drift off again, slipping to 57, 55, 52, finally 50. They are mildly concerned but still convinced that the stock is a bargain at that price. Probably there is momentary hesitation in the decline at 50, and then prices break on down.

Briefly, there is hope that the break is only a shakeout to be recovered quickly, but that hope vanishes as the downtrend continues. Now our new owners begin to worry. Something has gone wrong. When the stock gets down below 45, the former bargain doesn't look so good. "Well, I guess I picked a lemon that time, but I won't take a loss in it. I'll just wait until it gets back up to 50 some day where I can get out even (except for expenses), and then they can have it." (Does it sound familiar, by any chance?)

Take the opposite side of the picture — the uptrend process.

You, along with many others, bought XYZ at 12, carried it up to 24, decided that was plenty high for it, and cashed in. Thereupon XYZ reacted to 20, and you congratulate yourself on your astuteness. But then, unexpectedly, it turns around and rushes up to 30. Now you don't feel so smart; that was a better stock than you gave it credit for being. You wish you had it back. You will not pay more for it, but if it comes back down to 24, the price at which you sold, you'll "reinstate your position."

Perhaps you have never been in either of these situations. Perhaps your own reactions wouldn't, in such cases, have been the same as those we have indicated. But, if you have had a fair amount of experience in the market — have some knowledge of the psychology of the "average investor" — you know that the pictures we have described are typical. …"

Trend extraction with graphical approach

Trendlines (return line) and Channels

A **channel** is the technical range between support and resistance levels that a stock price has traded in for a specific period of time.

A **trendline** is a straight line, drawn obliquely, so as to accompany the direction of trend in progress.

Bearish trend line are drawn over pivot highs; bullish trendline are drawn under pivot lows to show the prevailing direction of price.

In some cases, it is possible to build a line connecting the maxima in a positive trend and minima in a negative trend, and that therefore runs parallel to the trendline forming a channel. This line defines a **return line**. It defines the boundaries of a sustained price increase or decrease, without the occurrence of excess.

Trendlines are a visual representation of support and resistance in any time frame.

Channel

(trend extraction with graphical approach)

A descending/ascending channel or downtrend/uptrend is the price action contained between two downward/upward sloping parallel lines.

Evaluating supports/resistances

(criteria for S / R "significance" in detecting trends)

- ***Volume*** An old Minor Bottom level at which only four or five hundred shares changed hands cannot set up much Resistance to a subsequent advance, but a Selling Climax Bottom where several thousand shares were bought will provide a lot of potential supply after prices, at some later date, have dropped well below it, and then attempt to rise up through it again.
- ***Number of "touch"*** The more times that the stock or index has tried unsuccessfully to break through the resistance level, the more formidable that area of resistance becomes.
- ***Duration*** is the length of time that has elapsed since support/resistance was formed and the nature of general market developments in the interim (intermediate S/R has less power than tops S/R). S/R range drawn on short term graphs - high frequency data – have less "power" respect to Support/resistance range drawn on monthly or annual graphs
- ***Repeating Historical Levels (S ⟺ R)*** If, once they had been set up, important Support and Resistance Levels always "worked," we should see Intermediate Tops and Bottoms form at exactly the same ranges year after year in one Bull and Bear cycle after another. As a matter of fact, there is a well-marked tendency for this to occur in old-line, actively traded stock.

  Over long periods, however, such S/R levels do tend to be gradually modified. One source of many important new Supply Zones is a Bear Market Panic In such a market previous underlying Support Zones loose "power".
- **Distance from the previous "touch" (for Resistances)** the distance that prices will have to climb before they encounter the old "support". Generally speaking, the greater the distance, the greater the resistance.
- **The angle of the trendline to the horizontal** (**only for trendlines)** The flatter, more nearly horizontal the trendline, the more important it is technically and, in consequence, the greater the significance of any downside break through it. A very steep line can easily be broken by a brief sideways (as consolidation moves before another extensive advance).

From trend extraction to trading strategy:

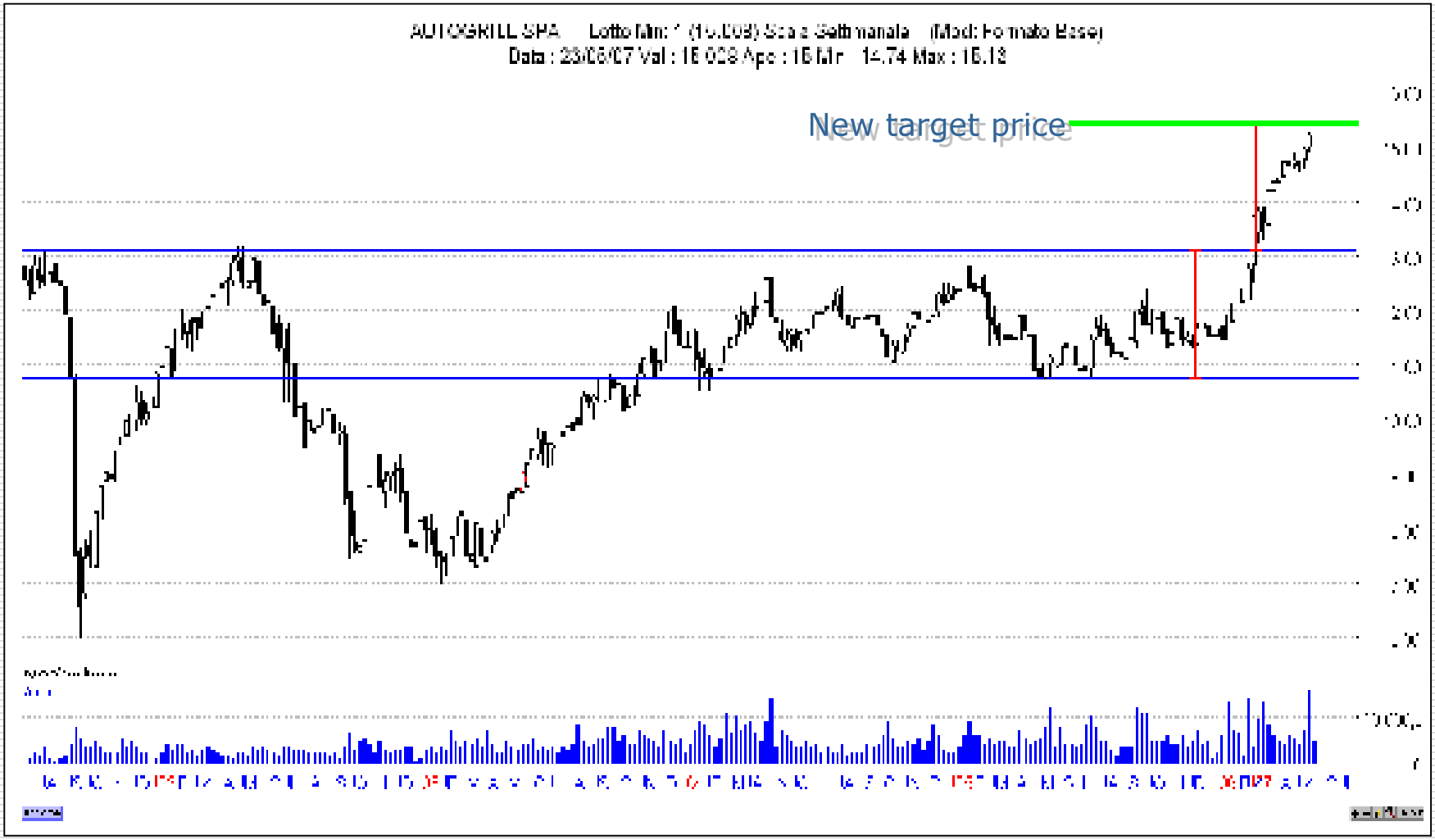
The measuring rule to determine target prices for Channels Breakouts

- Technicians expect that a price movement through an identified level of Support/Resistance, is usually followed by sharp:
  - declines with increased volatility and (frequently) heavy volume.
  - increase with increased volatility and heavy volume.
- They have observed that after a breakout, the price action have enough momentum to maintain its direction for a distance equal to the range of the broken channel (measured in logarithmic scale).

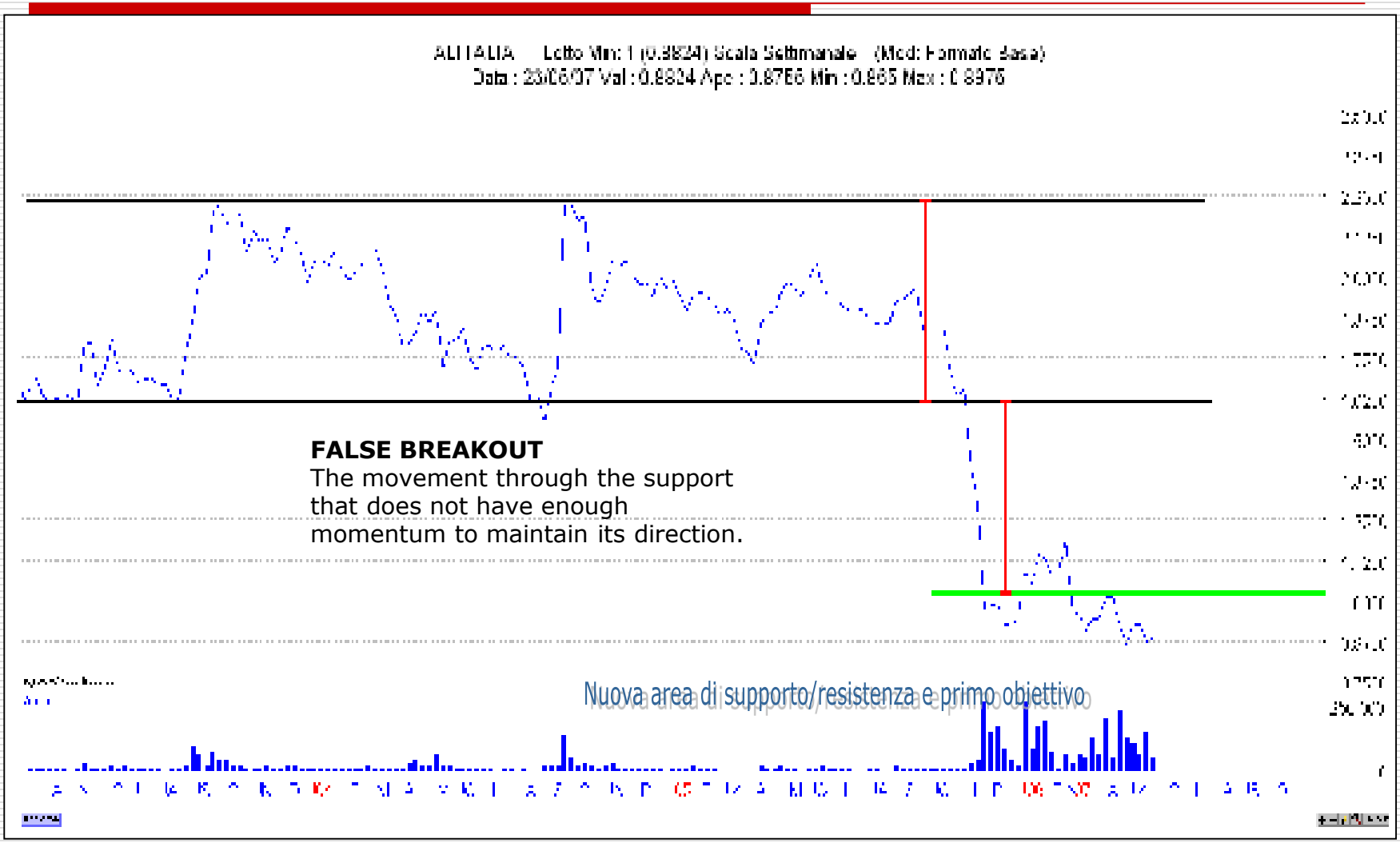
→ **The projection of the channel range gives a "target price" at which a new support/resistance is expected to act.**

- When a return line is violated, two different situations are expected:
  - a continuation of the trend, but with greater speed and with the possibility to have excesses that will be subsequently corrected
  - a reversal of the price movement, over the return line (exhaustion sign)

Resistence Breakouts and new TP



Support Breakouts and new TP



Grafical pattern for «not straight» trend

Reversal and Consolidation patterns

The Principle.

Stock prices move in trends of different shape produced in a series of action and reaction waves of great uniformity. Sooner or later, these trends change direction; they may:

- reverse (as from up to down)
- be interrupted by some sort of sideways movement and then, after a time, proceed again in their former direction.

In most cases, when a price trend is in the process of Reversal, either from up to down or from down to up, a characteristic area or “pattern” takes shape on the chart, becomes recognizable as a Reversal Formation.

Similarly, there are market phases where i**nvestors can "accumulating" (buying) or "distributing" (selling) a certain stock.** Thus a characteristic area or “pattern” takes shape on the chart, becomes recognizable as a Consolidation Formation.

The first and most important task of the technical chart analyst is to detect the main graphical patterns and to assess what they may signify in terms of trading opportunities.

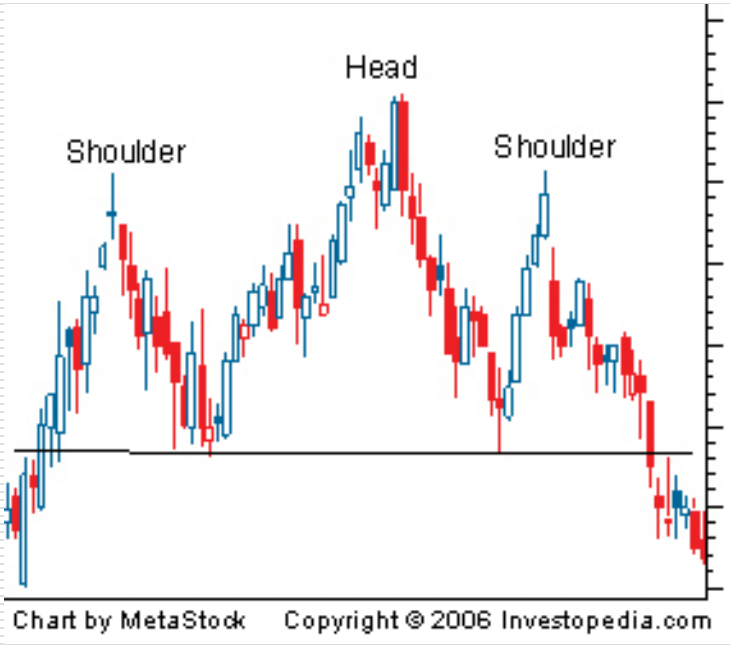
Main Reversal patterns

Head and Shoulder (Top).

The Head and Shoulder describe a chart formation in which a stock's price:
1. Rises to a peak and subsequently declines (forming the first shoulder)
2. Then, the price rises above the former peak and again declines (forming the head)
3. And finally, rises again, but not to the second peak, and declines once more (2nd shoulder).

Investors typically enter into a short position when the price break the level of support drawn connecting the two points at the base of the head (neckline).

The neckline is used by traders to determine the target price. The downward projection from the neckline of the distance between the neckline and the head top (on a semi-logarithmic scale) gives a "target price" at which a new support/resistance is expected to act.



Main Reversal patterns

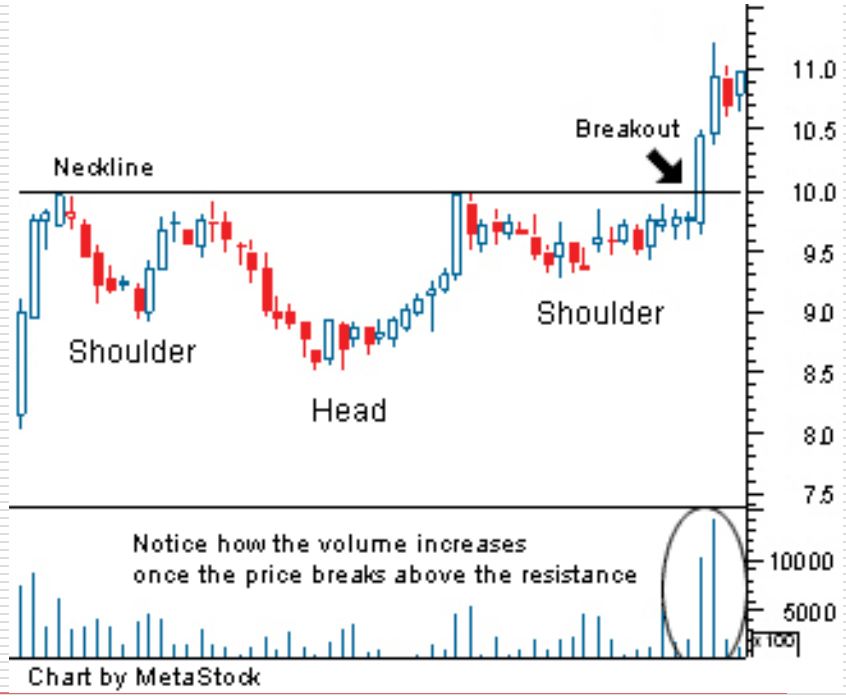
Head and Shoulder (bottom)

This pattern is identified when the price action:
1. falls to a trough and then rises.
2. falls below the former trough and then rises again.
3. Finally, the price falls again, but not as far as the second trough.

Once the final trough is made, the price heads upward toward the resistance found near the top of the previous troughs (neckline).

Investors typically enter into a long position when the price rises above the resistance of the neckline. The first and third trough are considered shoulders, and the second peak forms the head.

MEASURING RULE:
The upward projection from the neckline, of the distance between the neckline and the head bottom (on a logarithmic scale) gives a "target price" at which a new support/resistance is expected to act.



Main Reversal patterns

*Head and Shoulder (*factors that modify the risk of a false signal*)*

As any graphical Pattern many variations can occur. Thus technicians connect the probability of future (trend) scenarios implied by a H & S upon the following features:

Breaking the Neckline: Is the final confirmation the H&S patterns is completed. Nevertheless, the Head-and-Shoulders is not complete. The neckline should be penetrated by a "decisive" margin in order to reduce the risk of a false signal (loosing return).

Volume dynamics patterns*:* the volume activity accompanying the most recent price Top/Bottom should be somewhat less than on the one preceding it. In the breakout point volumes are expected "high". One – possible - exception the support breakdown in a H&S Top, that can also occur in the presence of a contraction of volumes.

Note that volume is relative; an high volume, means a rate of trading notably greater than has been customary in that particular stock during that particular period under examination.

Pullback: Head-and-Shoulders are also confirmed by a decisive neckline penetration followed by a brief reversal of the prevailing trend which makes the price move back to the neckline (rarely through it). This "False moves", signaling a slight pause in upward momentum, are rare.

Main Reversal patterns

*Head and Shoulder (*factors that modify the risk of a false signal*)*

Symmetry. In H&S patterns the right shoulder tends to resemble the left in price (although not, of course, in volume)
But you will not see very many formations as perfect and symmetrical as our ideal picture. Either shoulder may, in fact, go higher or take more time than the other. In general, there seems to be a balanced relation between the three elements of price pattern, time, and volume. However, there are no "laws" and a central role is played by the technician's experience

Neckline slope. The neckline may slope up (from left to right) or down. It is sometimes said that a down(up)-sloping neckline indicates an unusually weak situation in Top(Bottom) H&S.

Main Reversal patterns

Double Top and Double Bottom

A Chart patterns in which the quote for the underlying investment moves in a similar pattern to the letter "W" (double bottom) or "M" (double top). Double top and bottom analysis is used in technical analysis to explain movements in a security or other investment, and can be used as part of a trading strategy to exploit recurring patterns.

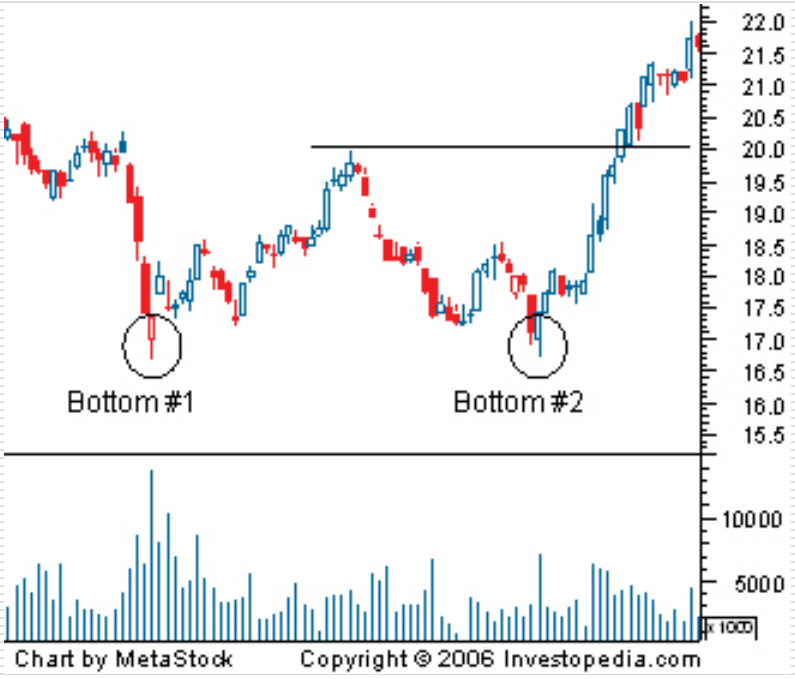
VOLUME and SHAPE:

Volume gradually diminishing as the pattern lengthens.

The second Bottom is usually conspicuously dull (little trading volume) and is apt to be quite rounded,

The second Top in a Double Top is moderately active and nearly as sharp and "sharp" in contour.

> Note that volume is relative; an high volume, means a rate of trading notably greater than has been customary in that particular stock during that particular period under examination.



Main Reversal patterns

Double Top and Double Bottom

FALSE SIGNAL: We should have some rule or criterion to distinguish a true Double Top Reversal Pattern from the Double Tops which do not imply Reversal when they appear as a part of a Consolidation Area in an uptrend.
TIME and WIDTH are important: If two Tops/bottom appear at the same level but quite close together in time and with only a Minor Reaction between them, we should expect that they are part of a Consolidation Area

Measuring Implications — A safe minimum measuring formula for the Duouble Top/Bottom is given by its width. Prices should go at least as far as the distance between the top and the bottom of the pattern (on a logarithmic scale).
This level gives a "target price" at which a new support/resistance is expected to act.

In the jargon of the Street, the second low of a Double Bottom is often referred to as a **"test",** in a sense that is just a test or corroboration of the Support (i.e., demand) which stemmed the first decline at the same level.
The *success* of that test is not *proved* until the pattern is to complete, that is until prices have not risen (on increasing volume) above the preceding high. Until such time as that has happened, there is always the possibility that a second test (third bottom) may be necessary.

Main Reversal patterns

Wedge

Consists of two trendlines that are in the same direction (both rising or both falling), with one trend line steeper than the second.

A Wedge usually breaks in the opposite direction of its trend. It is confirmed when one of its trendlines are broken.

MEASURING RULE: The breakout price (which is where price pierces a trendline) minus/plus the difference between highest/ and lowest price peak at the end of the chart pattern

Main Continuation/Reversal patterns

Ascending /Descending (right-angle) Triangles

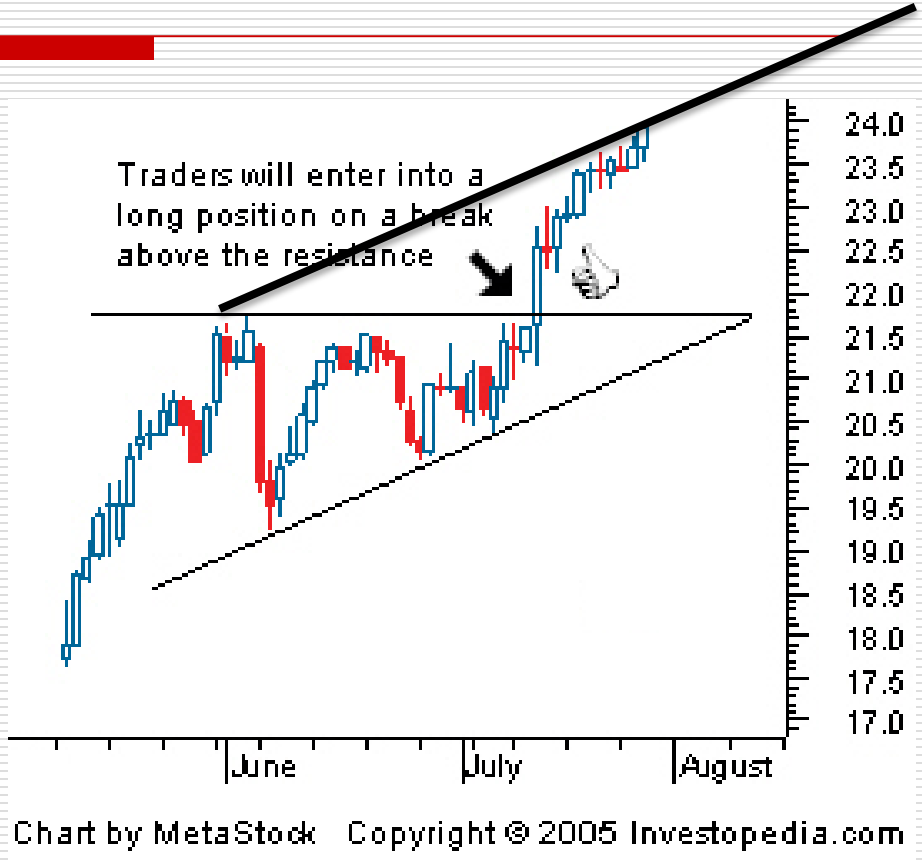
Ascending (right-angle) Triangle: A **bullish** chart pattern that is easily recognizable by the distinct shape created by two trendlines, one is drawn horizontally at a level that has historically prevented the price from heading higher, while the second trendline connects a series of increasing troughs

Descending (right-angle) Triangle: A **bearish** chart pattern that is created by drawing one trendline that connects a series of lower highs and a second trendline that has historically proven to be a strong level of support. Traders watch for a move below support, as it suggests that downward momentum is building.

Target Price (Triangle)

The measuring rule to apply to price movements

In an up-movement (upside breakout): draw from the Top of the first rally (that initiated the pattern) a **line parallel to the Bottom boundary**.
This line will slope up away from the pattern to the right. Prices may be expected to climb until they reach this line.
The same rules apply (but measuring down, of course, from the lower left corner) to a descending move.



Note: The above rule is neither as definite nor as reliable as the Head-and-Shoulders rule.

Main Continuation/Reversal patterns

*Triangles (*factors that modify the risk of a false signal*)*

As any graphical Pattern many variations can occur. Thus technicians connect the probability of future (trend) scenarios implied by a Triangle upon the following features:

Breaking the Trendlines: between 1/3 and 2/3 of the distance between triangle's base and its (projected) apex. Nevertheless, the Triangle pattern is not complete. The trendline should be penetrated by a "decisive" margin in order to reduce the risk of a false signal (loosing return). Usual criteria to evaluate in advance the risk of a false trendline breakout apply (number of "touch", duration, volumes ...).

Volume dynamics patterns*:* Activity tends to lessen as prices move out toward the apex. This overall diminishing trend of volume take place until the breakout point is reached. Upside breakouts (from an Ascending Pattern, of course) are attended by a conspicuous increase in trading volume; if not, they should be treated as suspect. Downside breakouts (from Descending Patterns) may not evince much of a pickup in activity, but turnover usually speeds up the second or third day out of pattern.

Pullback: Throwback reactions to the pattern's boundary line after a breakout are fairly common; their occurrence seems to depend largely on general market conditions. Thus, if prices break down out of a Descending Triangle in an individual stock at a time when the rest of the market is firm, a Pullback Rally is fairly certain to intervene before any very extensive further decline takes place.

Main Continuation/Reversal patterns

Simmetric Triangle

A technical analysis pattern created by drawing trendlines along a price range that gets narrower over time because of lower tops and higher bottoms. They perform like the Right-angle Triangles but they don't give advance notice of "their intentions". Moreover false moves from Simmetric-Angle formations are quite common. Obviously, the later the breakout, the more suitable it is to be a false move.

Variations of a symmetrical triangle include ascending and descending (symmetrical) triangles. their names, for the supposition always is that prices will ascend out of the ascending form and descend from the Descending form.

MEASURING RULE:

It is expected that after a trendline breakout the price has enough momuntum to cover a distance equal to the width of the base of the triangle (distance measured in log)

Main Continuation/Reversal patterns

Rectangle

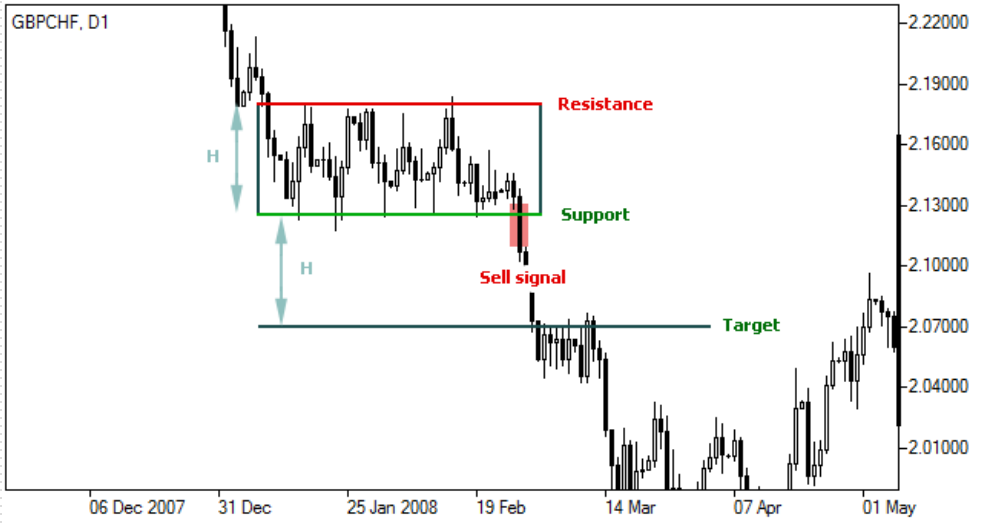
A pattern formed on a chart where the price of a security is trading within a bounded range in which the levels of resistance and support are parallel to each other, resembling the shape of a rectangle.
Rectangles occur in situations where a security is consistently bought up, when a lower price value is established, and sold down, when an upper value is similarly established. Often rigid trading patterns, such as rectangles, are associated with well-informed investors buying and selling a security.

This pattern signals that the price movement, which has stalled during the pattern, will trend in the direction of the price breakout of the bounded range.

Large price movements in one direction or another are not uncommon, when either the upper or lower limits of the rectangle's pattern are broken. Once the security breaks out of the range, in either direction, it is considered to be trending in the direction of the breakout.

Target Price (Rectangle)

The measuring rule



Measuring Implications — A safe minimum measuring formula for the Rectangle is given by its width. Prices should go at least as far as the distance between the top and the bottom of the pattern (on a logarithmic scale).
This level gives a "target price" at which a new support/resistance is expected to act.

As the formation of this pattern will see the price of the security test the levels of support and resistance several times before a breakout, is possible to short the security just below the resistance or open long position just above the support.
In both cases target prices are determinate by opposite support/resistance line

Main Continuation/Reversal patterns

*Rectangles (*factors that modify the risk of a false signal*)*

Volume — as in the Triangles, gradually diminishing as the Rectangle lengthens. Any contrary development, unless it be a momentary news flurry, is suspect.

Breakouts — To be completed the pattern must show a breakout point along a support or a resistance. In order to evaluate in advance the risk of a false breakout is possible to apply the same rules for assessing the risk of failure of a support and a resistance (number of "touch", duration, volumes ...).

> Note: False Moves are much less frequent from Rectangles than from Symmetrical Triangles. A clearly defined Rectangle is, in fact, almost as reliable as a Head-and-Shoulders, although not as powerful in its implications.

Pullbacks — Return of prices to the boundary of the pattern, subsequent to its initial penetration (breakout), takes place more frequently with Rectangles than with Symmetrical Triangles.
Empirical evidence show that a Pullback or Throwback (the first is the common term for a rally after a downside breakout, and the second for a reaction following an upside breakout) occurs within 3 days to 3 weeks in about 40% of all cases.

Directional Tendency — The Rectangle is more often a *Consolidation* Formation than a *Reversal* Formation, the ratio being about the same as with Symmetrical Triangles. As Reversal Patterns, Rectangles appear more frequently at Bottoms (either Major or Intermediate) than at Tops.

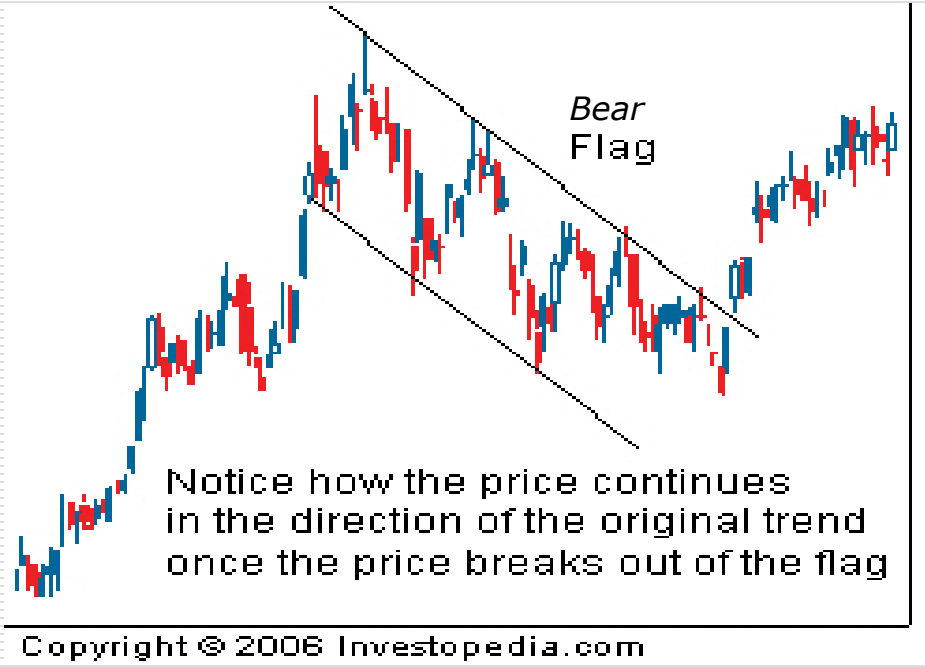
Main Continuation patterns

Flag (Bull or Bear)

A technical charting pattern that looks like a flag. Flags result from price fluctuations within a narrow range and mark a consolidation before the previous move resumes.

It appears like a small, compact parallelogram of price fluctuations, or a tilted rectangle which slopes back **moderately against the prevailing Trend**

Trading volume diminishes during their formation and increases again as prices break down away from them.



Main Continuation patterns

Flag (Bull or Bear): MEASURING RULE

Flag is an "Half-Mast" Patterns which ordinarily forms after a fairly steady and rapid (steep) price movement.
In applying the measuring rule, go back to the beginning of the trend movement and measure from there to the minor reversal level at which the Flag started to form. Then measure the same distance from the point where prices break out of the Flag in the same direction. This projected price is the minimum expectation of this type of Consolidation Pattern

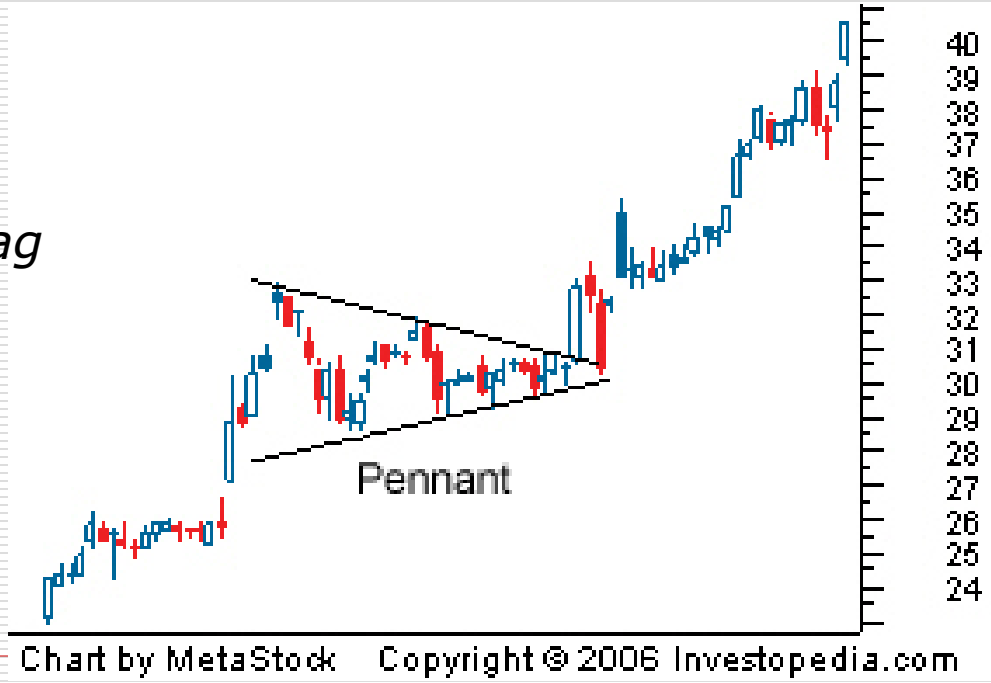
Semilogarithmic chart.
As advances from the pattern (in an uptrend) generally go farther (in terms of points or euros) than the preceding move, while declines may not carry quite so far, is best applied the formula on a semilogarithmic chart

Main Continuation patterns

Pennant

A continuation pattern in technical analysis formed when there is a large movement in a stock, the flagpole, followed by a consolidation period with converging trendline, the pennant, followed by a breakout movement in the same direction as the initial large movement, the second half of the flagpole.

The Pennant — A Pointed Flag

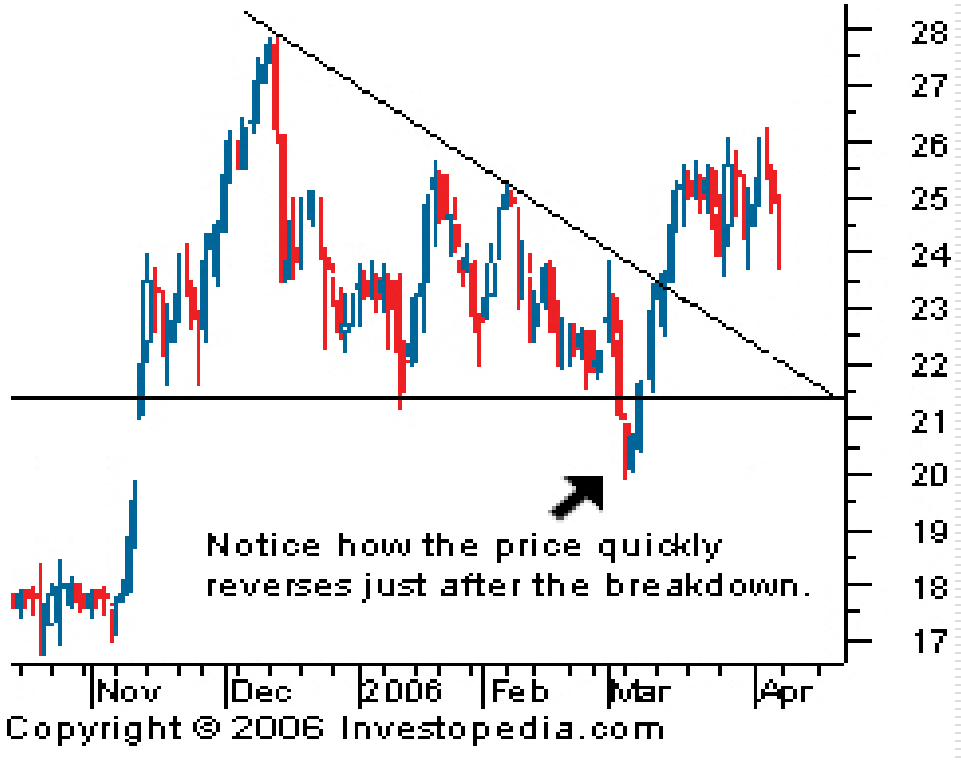


From trend extraction to trading strategy:

False moves and premature breakout

Not always a movement through an identified level of support or resistance has enough momentum to maintain its direction. Since the validity of the breakout (or breakdown) is compromised, many traders close their positions and the price fails to make the sharp move that many were expecting.

Note**: both false moves and premature breakouts **are indistinguishable at the time they occur from genuine breakouts.
Following both false and premature breaks, prices return inside the pattern. But, in the case of a False move, the trend ultimately proceeds out of pattern in the opposite direction, while in the case of the premature move, the trend finally breaks out again and proceeds in the Same direction.



Trading range break-out.

- Breakout trading is used by active investors to take a position within a trend's early stages. Generally speaking, this strategy can be the starting point for major price moves with expansions in volatility.

- **A breakout is** a stock price that moves outside defined **support** or **resistance** level with (often) increased volume. A breakout trader enters a long position after the stock price breaks above resistance or enters a short position after the stock breaks below support.
- Once the stock trades beyond the price barrier, volatility tends to increase and prices usually trend in the breakout's direction.

- In many circumstances, breakouts are the starting point for major price trends (the starting point for future volatility increases and large price swings).
- Regardless of the time frame, ranges are easy to spot, making the range breakout strategy very popular. Whether you use intraday, daily or weekly charts, the concepts are universal. You can apply this strategy to day trading, swing trading or any style of trading.

Trading range break-out.

- **Breakout trading welcomes volatility**. The volatility experienced after a breakout is likely to generate emotion because prices are moving quickly and in a volatile fashion. Unfortunately volatility means «risk» and many traders lose money on this strategy, mainly because of false breakouts, corrections to the breakout point and unrealistic expectations.
- Range breakout examples are often used to show a stock or commodity breaking out and making a large percentage sprint, this is not always the case. With potentially hundreds of ranges being traded in different instruments in markets around the world, the probability of picking the few that will eventually explode is not high, but yet it is the dream of breakout traders to have that trade and ride it out for a fabulous gain.
- Unfortunately, large moves (and large gains) are rare, and given the difficulty to be patient and waiting for the breakout to happen, the trader is often not even in the trade when that move finally does occur.

… not only quantitative finance instruments (techniques)

… but psycology and strategy

Measure the trend's quality

(in the technical analysis approach)

Oscillators

…How to reduce
False moves and
premature breakout

Measure the trend's quality
(Confirmation principle)

Confirmation referes to the occurrence of two or more indicators corresponding with one another and thereby corroborating the trend scenarios used to trade.

Traders look to different technical indicators to confirm their expected prediction so that they can have as many technical factors working in their favor as possible. This increases the probability of making a highly successful trade reducing False moves and premature breakout

Among more important technical indicators

- **Volumes** *(seen)* → Trend's "Potential energy"
- **Oscillator** → Trend's "Kinetic energy"

These measures are complementary to trends' extraction techniques (graphical or quantitative).

A technical analyst should therefore **NOT** base trading strategies **ONLY** on the information obtained by volume or the oscillators.

Prices' dynamics analysis (Oscillators)

The measures of price changes over time are known as oscillators. They are used to "weigh" the quality of price movements.

The simplest oscillator is the momentum (the difference of today's price with respect to the price several (N) periods ago

$$momentum = (P_T - P_{T-n})$$

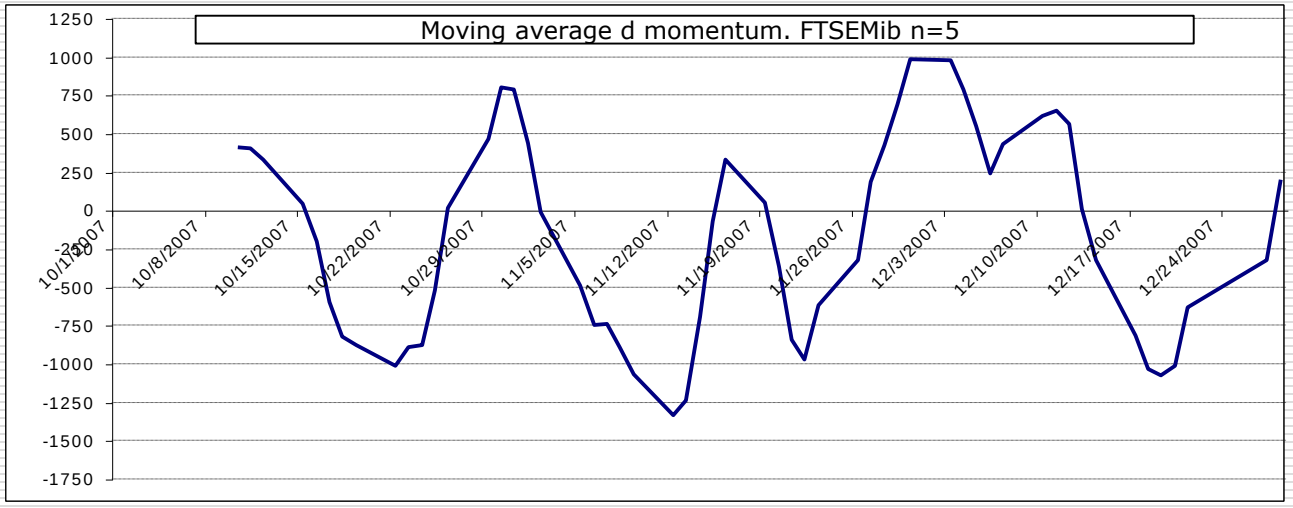
The price P generally considered is the closing price, but it is possible to measure the "inertia" of any price: maximum, minimum or opening price.

In general, oscillators are built around a difference over time in prices (or their transformations, eg moving averages).
Being based on a price (first) difference, oscillators allow to change our view on price action by removing the trend factor **transforming price information to a stationary scale**

Prices' dynamics analysis (Oscillators)

The oscillators are constrained in a precise oscillation band (generally from 0 to 100% or -100% to 100%), or not limited; in that last case is possible to approximate the oscillation band considering historical values

The oscillators are generally represented by graphs. As for prices, oscillators' moving averages allow to represent the inertia in prices filtering out part of the erratic component

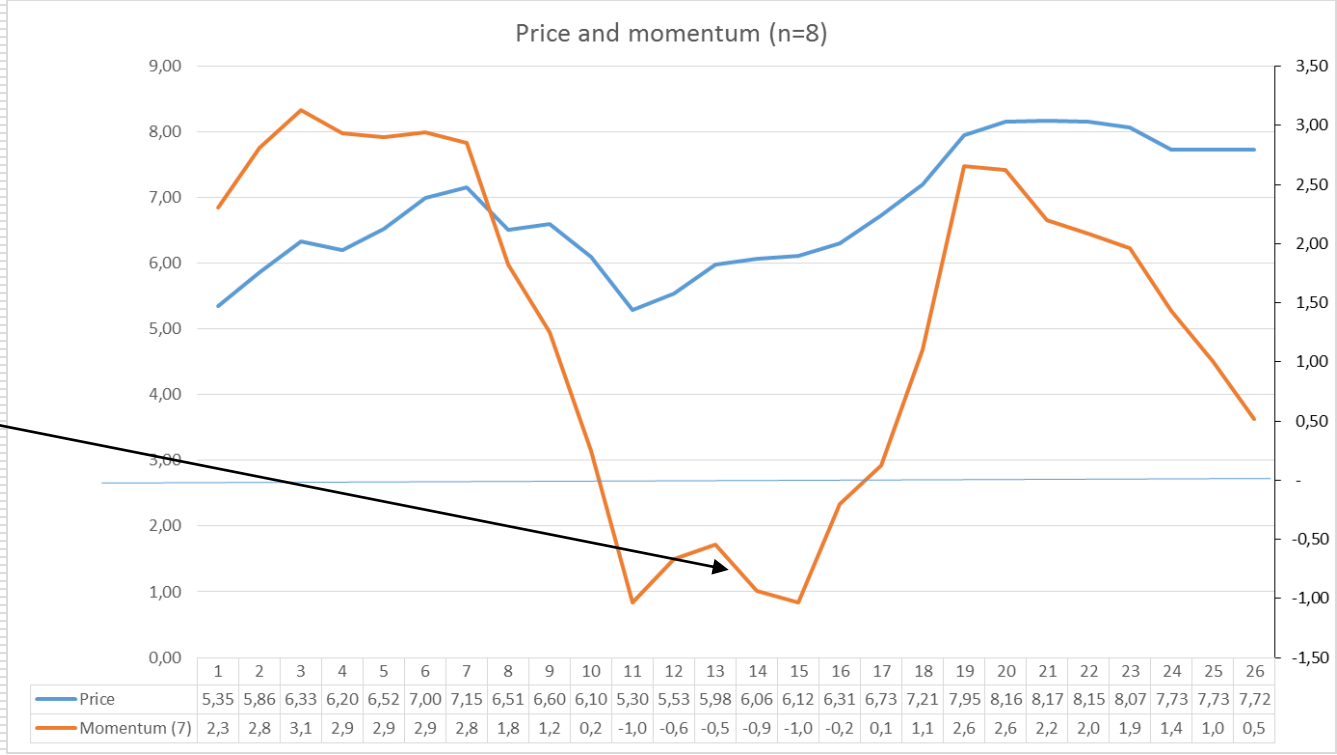


Prices' dynamics analysis (Oscillators)

Overbougth and Oversold

Oscillator are designed to highlight if the current prices grow / fall with a dynamic **"more intense"** than was expected on the basis of what happened in the past chosen as the basis for comparison (P_{t-n}).

An oscillator in the negative area and with a negative slope, it doesn't indicates that the price is decreasing. The oscillator measures the relative strength of the price.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
Price	5,35	5,86	6,33	6,20	6,52	7,00	7,15	6,51	6,60	6,10	5,30	5,53	5,98	6,06	6,12	6,31	6,73	7,21	7,95	8,16	8,17	8,15	8,07	7,73	7,73	7,72
Momentum (7)	2,3	2,8	3,1	2,9	2,9	2,9	2,8	1,8	1,2	0,2	-1,0	-0,6	-0,5	-0,9	-1,0	-0,2	0,1	1,1	2,6	2,6	2,2	2,0	1,9	1,4	1,0	0,5

Prices' dynamics analysis (Oscillators)

Overbougth and Oversold

When an oscillator takes an "extreme" value, also the prices' dynamics are "extreme" (upward or downward).

The situation in which the price of a security has risen to such a degree - usually on high volume - that an oscillator has reached its upper bound is defined as **overbougt.**
The situation in which the price of an asset has fallen to such a degree - usually on high volume - that an oscillator has reached a lower bound is defined as **oversold.**

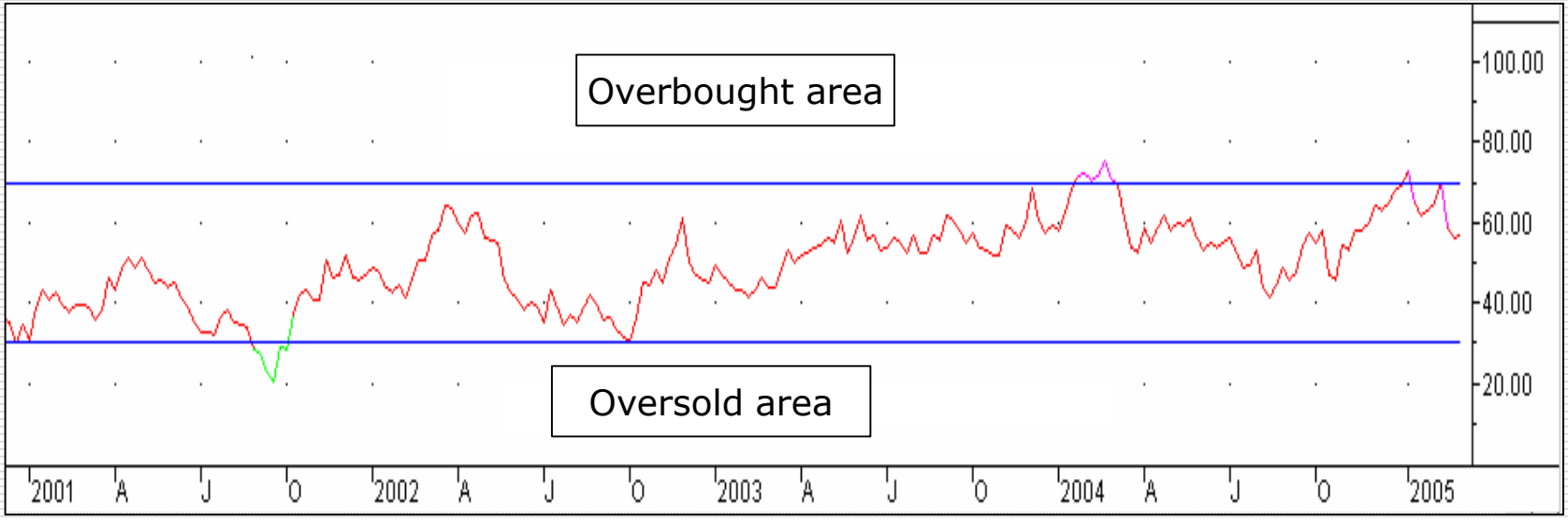
Grafic analysis could be usefull to determine the two constants that limit the top and bottom of any oscillators "normal" variation range.
The areas above and below these constants are defined **overbought area and oversold area**

Prices' dynamics analysis (Oscillators)

Overbougth and Oversold

The determination of the constants of oversold and overbought is subjective and differs if the oscillator varies or not vary on a limited range

When the range of the oscillator is bounded, the two constants are symmetric to center and include from the 40 to the 60% of the range (eg 30% and 70% in the case of an index which varies between 0 and 100% as in the following example).



Prices' dynamics analysis (Oscillators)

Overbougth and Oversold

In the case of unbounded oscillators - as is the momentum - it is not possible to define a general rule for determining the constants of overbought and oversold. The constants must be placed "enough" away from their central value and symmetry not necessarily holds.

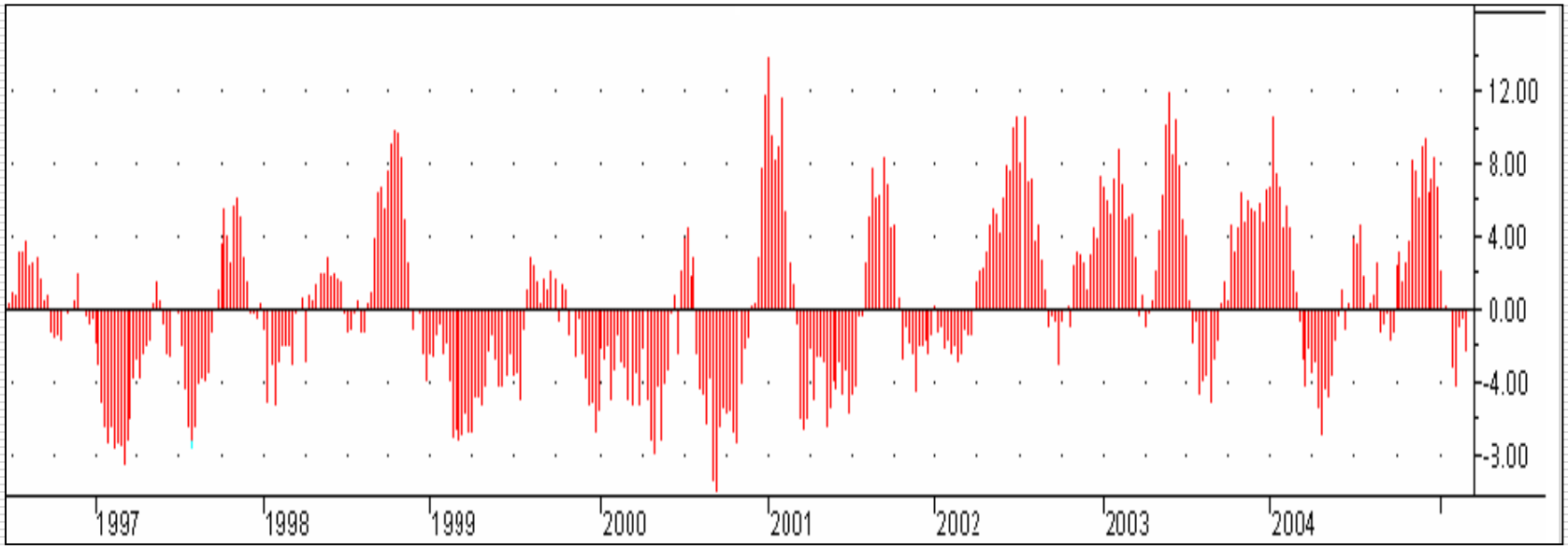
Overbought and oversold constants could be calibrated looking at historical values.

The median of the oscillator (usually the 0) become important as it represent a demarcation between periods in which prices have a dynamic with negative momentum and periods where prices have a positive momentum.

Prices' dynamics analysis (Oscillators)

Overbougth and Oversold

price fluctuations in relation to the central value (0)



Overbought and oversold only depends on prices' market dynamics. Thus a financial instrument is overbought or oversold **regardless of the level reached by its market price.**

Prices' dynamics analysis (Oscillators)

oscillators in trading strategies

As market tops are typically reached with a rapid price increase (when everyone expects prices to go higher) and market bottoms typically end with a rapid price decline (when everyone wants to get out)...

- **Contrarian view** (**leading indicator)**. High or low oscillators values suggest an inversion of the current trend (because extreme dynamics generally anticipates reversals in the trend of prices)

- **Trend-following view**. High or low values suggest a continuation of the current trend (because extreme dynamics generally highlights an acceleration in the trend of prices.)
  "….Trading in the direction of trend is like riding a bike with the wind at your back".

In either case, technicians suggest **only trade after prices confirm the signal** generated by the indicator (e.g., do not trade only with oscillators) and to use oscillators only to modify the subjective probability given to different scenarios (or to set up a money management strategy).

Prices' dynamics analysis (Oscillators)

oscillators in trading strategies

Oscillators are particulary usefull in accumulation or distribution market phases.

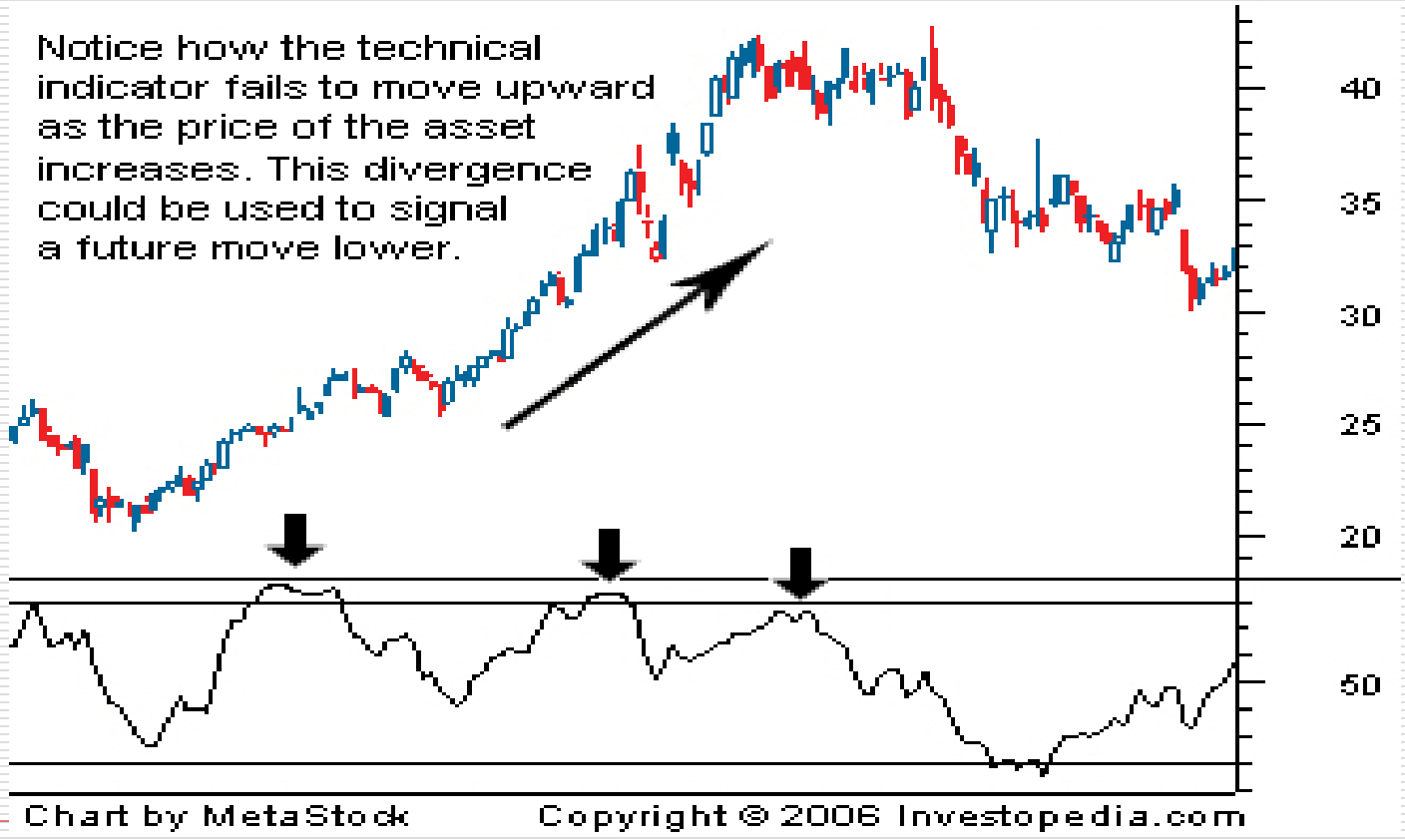
In absence of a well defined trend, the association to each market price its "momentum", helps to assess the probability of a continuation in the movement or, rather, of its reversal.

Many oscillators, at a market top, will climb sharply and then fall off — **diverging from the continued upward or sideways movement of the price**. Similarly, at a market bottom, they will drop sharply and then begin to climb well ahead of prices. Both of these situations result in

divergences between the indicator and prices.

Divergence

When the price of an asset and an indicator, index or other related asset, move in a different (opposite) directions.



Main Oscillators

- **ROC** (Rate of Change): summarizes, in relative terms, the change in prices respect to a previous **point**
- **RSI** (Relative Strength Index) summarizes the direction and "average" strength of prices' action **over a period**.
- **MACD** (Moving Average Convergence Divergence) measures the distance between two **moving averages** (simple or exponential), with different temporal extension
- **Stochastic** attempts to anticipate price turning points by comparing the **closing price** (hourly, daily, weekly, ...), of a security to its price range. Technicians expect that in an upward-trending market, prices tend to close near their high, and during a downward-trending market, prices tend to close near their low.

Rate of change

A technical indicator that measures the percentage change between the most recent price and the price (closing, opening maximum or minimum) "n" periods in the past.
It is calculated by using the following formula:

$$ROC_T(n) = \frac{(P_T - P_{T-n})}{P_{T-n}} \cdot 100$$

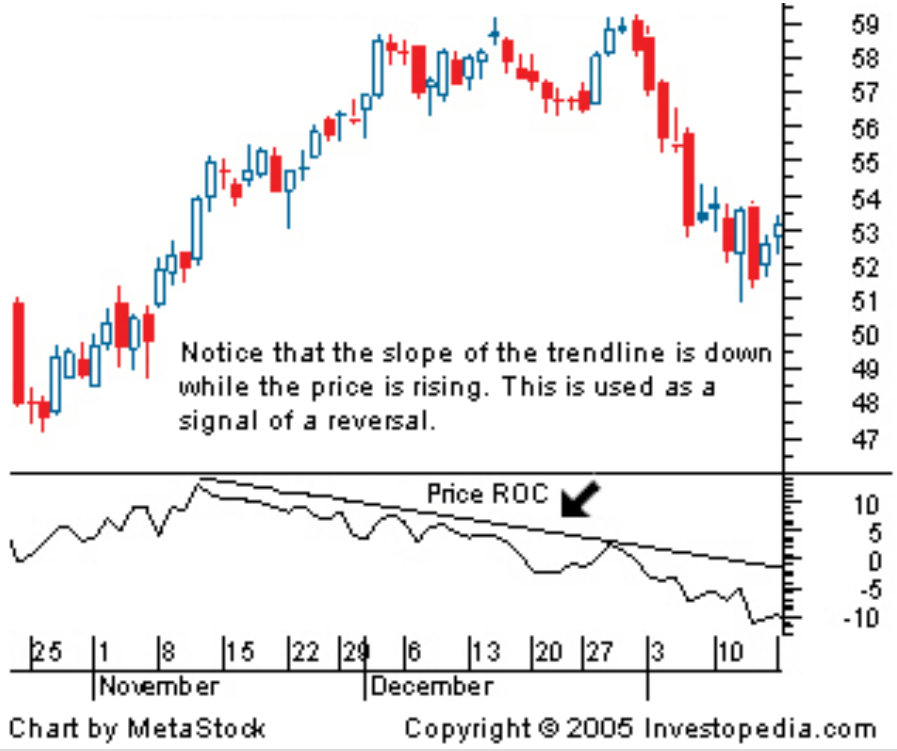
ROC is classed as a price momentum indicator or a velocity indicator because it measures the rate of change or the strength of momentum of change.

Rate of change

Many traders use a value greater than zero to indicate an increase in upward momentum and a value less than zero to indicate an increase in selling pressure. **Thus the zero line represent the "signal line"**

However, some of **the most valuable signals** are generated when the price of the asset and the ROC are heading in opposite directions (divergence).

For example, in the chart you can see that the ROC is sloping downward while the price of the asset is increasing. This is generally an early indication that a sharp decline may be on the way.



The choice of the parameter «n»

There is no unambiguous rule to select the number of periods (n) to be consider "optimal". In general, the value will depend on the investment horizon and, therefore, from the adopted trading style (short term trader or investor).

Among the "practitioners" is widespread the choice of time lags related to both **the Fibonacci sequence** and **the calendar seasonality**.
Examples of the latter are: n=5 or multiples in daily charts (a week), n=4 or multiple for the weekly analysis, n=12 or multiple on monthly charts.
Examples of the former are n= 3,5,8,13,21,… :

A less "naive" approach is based on ex-post simulation of the gains/losses associated to different *n*

Moving Average Convergence Divergence MACD

A trend-following momentum indicator that shows the relationship between two moving averages (simple, wheigthed or exponential) of prices.

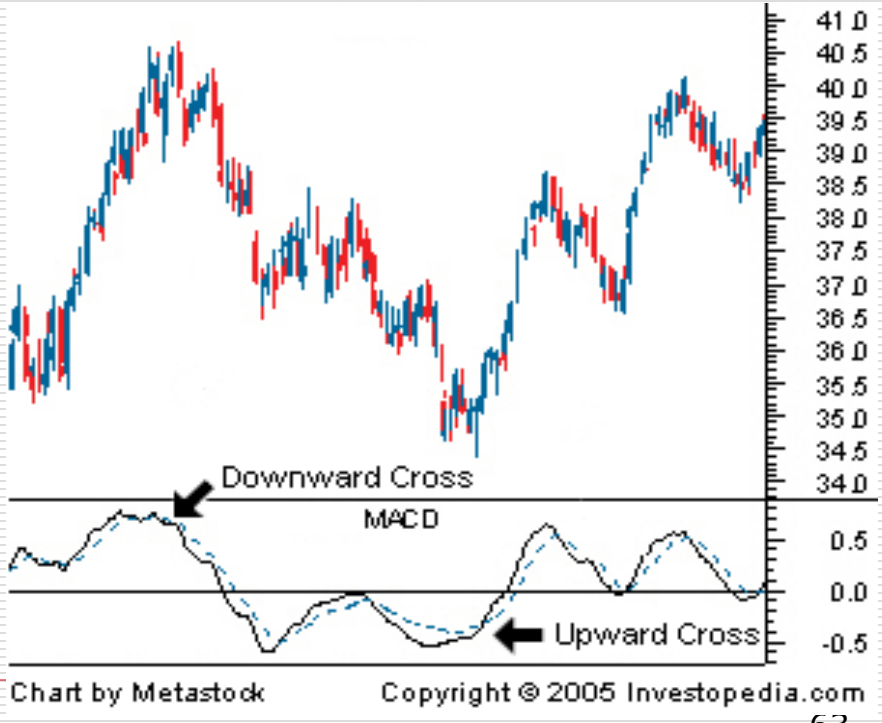
$$MACD_T(n1,n2) = MM_T(n1) - MM_T(n2) \qquad n1 < n2$$

As for the momentum, the oscillator moves around to 0.

MACD >0 if the faster (short term) moving average is above (bullish trend)

MACD < 0 if the slower moving average is above (bearish trend)

MACD is 0 when the two means are equal.

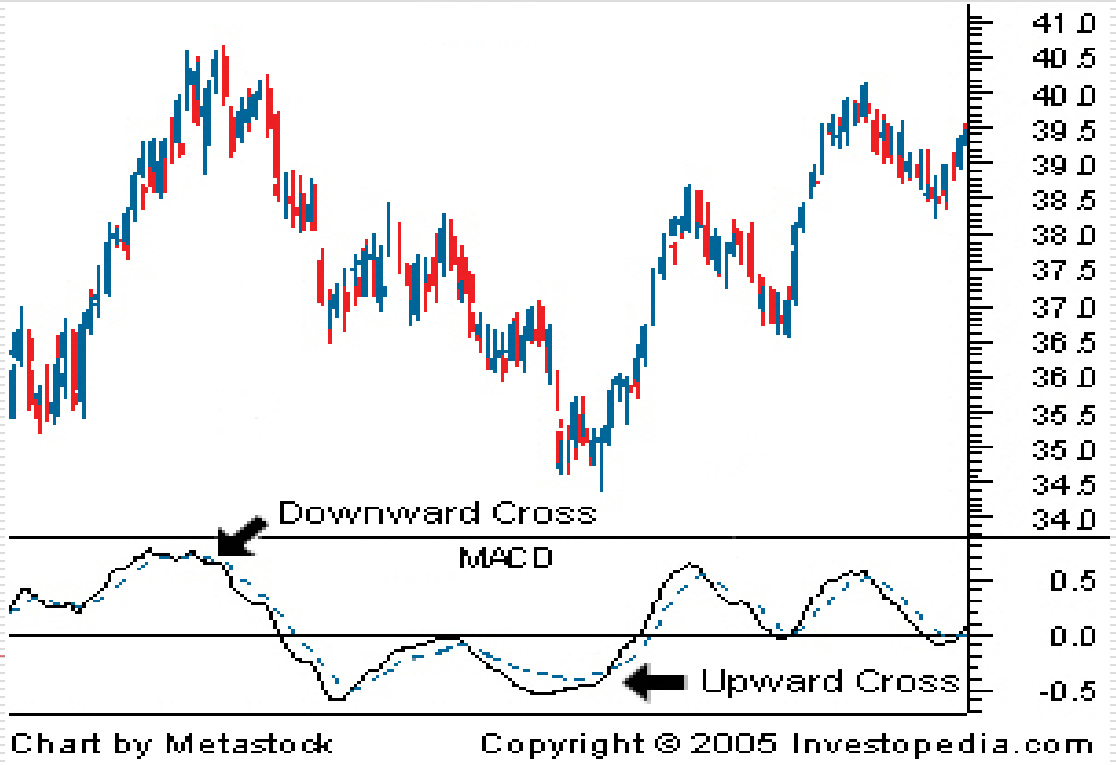


Moving Average Convergence Divergence MACD

Complete the indicator a moving average of the MACD, called the "signal line". Plotted on top of the MACD, it functions as a trigger for buy and sell signals following the crossover rule.

$$MACDS_T(n3) = MM_T(MACD(n1,n2))$$

CROSSOVER RULE:
an investor in a particular financial instrument, should take a long position when a fast MA crosses above a slower MA. A short position is initiated when the slow MA crosses above the faster MA



Relative Strength Index
RSI

A technical momentum indicator that compares the magnitude of recent gains to recent losses in an attempt to determine overbought and oversold conditions of an asset. It is calculated using the following formula:

$$RSI_T(n) = 100 - \frac{100}{(1 + {}^{T-n}H_T / {}_{T-n}L_T)}$$

${}_{T-n}H_T$ The average of n days' up closes

${}_{T-n}L_T$ The average of n days' down closes

Alternative versions of the indicator can be calculated substituting the average operator with:

- The sum of changes (positive and negative)
- The number of changes (positive and negative). In this case the oscillator assumes discrete values and is less sensitive to prices' volatility.

Relative Strength Index
RSI

The RSI ranges from 0 to 100. An asset is deemed to be overbought once the RSI approaches the 70 to 80 level, meaning that:

1. it may be getting overvalued and is a good candidate for a pullback.
2. it has started an (exaggerated) price appreciation, maybe linked to the beginning of a speculative bubble.

Likewise, if the RSI approaches 20 to 30, it is an indication that the asset:

1. may be getting oversold and therefore likely to become undervalued.
2. it has started an (exaggerated) price depreciation

As any other oscillator, the RSI is best used as a valuable complement to other stock-picking tools.

A trader using RSI should be aware that large surges and drops in the price of an asset will affect the RSI by creating false buy or sell signals.

Stochastic Oscillator

A technical momentum indicator that compares a security's closing price to its price range over a given time period.
"Stocastic" refers to the location of a current price in relation to its price range over a period of time. The indicator is calculated as follows:

$$\%K = 100\frac{(C_T - {}_{T-n}L_T)}{({}_{T-n}H_T - {}_{T-n}L_T)}$$

C_T = the most recent closing price

${}_{T-n}L_T$ = the low of the 14 previous trading sessions

${}_{T-n}H_T$ = the highest price traded during the same 14-day period.

The oscillator's **range** goes **from 0 to 100**, since the denominator is the maximum of the numerator.
The huge oscillator's sensitivity to market movements can be reduced by adjusting the time period or by taking a moving average of the result usually known as %K slow: (%KS)

%KS = n_2-period moving average of %K

Stochastic Oscillator

If price volatiltiy is high, an exponential MA of the %KS indicator may be taken, which tends to smooth out rapid fluctuations in price.

%D = n_3-period exponential moving average of %KS

The theory behind this indicator is that **in an upward-trending market, prices tend to close near their high**, and during a downward-trending market, prices tend to close near their low.
It follows that (in positive trend), new closing prices nearby the minimum, indicate a weakening of the upward phase

Stochastic Oscillator

Transaction signals

The simplest transaction signals occur when the faster %K (or %KS) line **crosses through** the %KS (or the %D) line. As “plain” crossovers can occur frequently, is better to look for crossovers occurring after a peak or trough in the %D line.

Another alert or set-up is present when the %D line **is in an extreme area and diverging** from the price action. This divergence is an indication that the momentum in the market is waning and a reversal may be in the making.

An event known as "stochastic pop" occurs when prices break out the overbougth/oversold constant and keep going. This is interpreted as a signal to increase the current position, or liquidate if the direction is against the current position. (see trading bias)

Stochastic Oscillator

Transaction signals

Trend follower strategy

Stocastic Oscillator is also used to define **trading bias.** Establishing a short-term trading bias with a long-term indicator is a recurring theme for trading strategies. Long-term indicators are used to define the path of least resistance, which becomes the trading bias. Traders look for bullish setups when the bias is bullish and bearish setups when the bias is bearish.

The chances of success are higher when the bigger trend is in your favor.