APPLICATION OF MOVING AVERAGE AS TECHNICAL INDICATOR TO PREDICT STOCK MARKET DIRECTION

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ABSTRACT

The shares and securities price movements as analyzed broadly by two key approaches, namely fundamental approach and technical approach. The fundamental approach emphasis much on the growth prospects of economy, stability of government, the prospects of the specific industry and the specific company whereas the technical approach emphasis much on the price and volume movement of the stock. Based on the price and volume movements of stock the buying and selling decisions are taken.

"The technical approach is the oldest approach to equity investment, dating back to the late 19th century. The technical analysis continues to flourish in modern times as well. It is widely used by institutional investors, operators and a large number of retail investors. In fact the investors analysis both fundamentals and technical so that he can buy the right stock at right time". The technical approach to investing is essentially a reflection of the idea that prices move in trends, which are determined by the changing attitudes of investors towards a verity of economic, monetary, political and psychological forces. The technical analysis helps the investor to identify the trend reversals at an earlier stage to formulate the buying and selling strategy. Technical analysts for using indicators like; Volume of trade, Breadth of the market, Moving averages, Short sales position, Odd lot trading, Relative strength and cash reserve ratio of mutual funds. These indicators are used to predict the direction of the price movement of scrip and the direction of the market and theses indicators the Moving average is considered as most reliable and the better indicator of the future direction. Most of the technical analysts use the moving average since it is very simple and gives reliable signal about the forth coming bull/bear trend.

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INTRODUCTION

A technical indicator is a series of data points that are derived by applying a formula to the price data of a security. Price data includes any combination of the open, high, low or close over a period of time. Some indicators may use only the closing prices, while others incorporate volume and open interest into their formulas. The price data is entered into the formula and a data point is produced.

For example, the average of three closing prices is one data point ((41+43+43)/3=42.33). However, one data point does not offer much information and does not an indicator make. A series of data points over a period of time is required to create valid reference points to enable analysis. By creating a time series of data points, a comparison can be made between present and past levels. For analysis purpose, technical indicators are usually shown in a graphical form above or below a security's price chart. Once shown in graphical form, an indicator can then be compared with the corresponding price chart of the security. Sometimes indicators are plotted on top of the price plot for a more direct comparison.

Use of technical indicator

"A technical indicator offers a different prospective from which to analyze the price action. Some, such as moving averages are derived from simple formulas and the mechanics are relatively easy to understand". Others, such as Stochastics, have complex formulas and requires more study to fully understand and appreciate. Regardless of the complexity of the formula, technical indicators can provide unique prospective on the strength and direction of the underlying price action.

A simple moving average is an indicator that calculates the average price of a security over a specified number of periods. If a security is exceptionally volatile, then a moving average will help to smooth the data. A moving average filters out random noise and offer a smoother prospective of the price action. Veritas (VRTS) displays a lot of volatility and an analyst may have difficulty discerning a trend. By applying a 10 days simple moving average to the price action, random fluctuations are smoothed to make it easier to identify a trend.

Indicators serve three broad functions: to alert, to confirm and to predict.

- An indicator can act as an alert to study price action a little more closely. If momentum is waning, it may be a signal to watch for a breakup support. Or, if there is a large positive divergence building, it may serve as an alert to watch for a resistance breakout.
- Indicators can be used to confirm other technical analysis tool. If there is a breakout on the price chart, a corresponding moving average crossover could serve to confirm the breakout. Or, if a stock break support a corresponding low in the On-Balance-Volume(OBV) could serve to confirm the weakness.
- Some investors and traders use indicators to predict the direction of future prices.

Moving Average

The word Moving means that the body of data moves ahead to include the recent observation. If it is 10 days Moving averages, on the 11^{th} day the body of data moves to include the 11^{th} day observation eliminating the first day observation likewise it continues. For the

moving average calculations the closing price of the stock is considered, because the day's closing price gives better indication about the next day's movements than the intra day's high low price. The Moving average can be calculated for the individual scrip and for the index and it indicates the underlying trend in the scrip (or) the market as the case may be. To predict short-term trend 10-30 days, to predict medium term, 50-125 days and to predict the long-term 200 days Moving average can be applied.

Meaning of Moving Average

In statistics a Moving average, also called a rolling average and sometimes a running average, is used to analyze a set of data points by creating a series of average of different subsets of the full data set. So a Moving average is not a single number, but it is a set of numbers each of which is the average of the corresponding subset of a larger set of data points. A simple example is if investor had a data set with 100 data points, the first value of the moving average might be the arithmetic mean (one simple type of average) of data points 1 through 25. The next value would be this simple average of data points 2 through 26, and so forth, until the final value, which would be the same simple average of data points 76 through 100.

The size of the subset being averaged is often constant, as in the previous example, but need not be. In particular, a cumulative average is a type of moving average where each value is the average of all previous data points in the full data set. So the size of the subset being averaged grows by one as each new value of the moving average is calculated. A moving average could also use a weighted average instead of a simple average, perhaps in order to place more emphasis on more recent data points than on other data points longer ago in time.

A moving average can be applied to any data set, but is perhaps most commonly used wit time series data to smooth out short-term fluctuations and highlight longer-term trends or cycles. The threshold between short-term and long-term depends on the application, and the parameters of the moving average will be set accordingly. For example, it is often used in technical analysis of financial data, like stock prices returns or trading volumes. It is also used in economics to examine gross domestic product, employment or other macroeconomic time series. Mathematically, a moving average is a type of convolution and so it is also similar to the low-pass filter used in signal processing. When used with non-time series data, a moving average simply acts as a generic smoothing operation without any specific connection to time, although typically some kind of ordering is implied.

This type of moving average trading system is not intended o get the investor in at the exact bottom and out at the exact top. Rather, it is designed to keep investor in line with the security's price trend by buying shortly after the security's price bottoms and selling shortly after it tops.

"The critical element in a moving average is the number of time periods used in calculating the average. When using hindsight, investor can always find a moving average that would have been profitable". The key is to find a moving average that will be consistently profitable. The most popular moving average is the 39-week (or 200-day) moving average. This moving average has a good track record in timing the major (long-term) market cycles. The length of a moving average should fit the market cycle investor wish to follow:

Types of Moving Averages and their calculations

There are four commonly used moving averages: - simple, smoothed, weighted and exponential. Simple moving averages giving equal weighting to each day's price of the number of days chosen for the study and some think this is disadvantageous. So, in an effort to give more importance to more recent price changes several different types of moving average have been developed.

Simple Moving Average

The more popular are the simple moving average and exponential moving averages (or exponential weighted moving averages). To construct the simple moving average or arithmetic mean, the required values for a particular is taken and its average is calculated. For a 20-day moving average, the latest 21-days values are taken and its average is calculated by adding all values and dividing it by 21.

Calculation of Simple Moving Average

Moving averages are commonly calculated for stock prices but they can just as easily be calculated for volume totals or any of the numerical values of other technical indicators derived from stock prices.

Moving averages of stock prices are usually calculated using the closing price. What, in effect, the moving average does, is to eliminate the fluctuations of price in all time periods below the number, which is chosen, for the average. i.e. a 5 day or 5 weeks respectively, a 200 day moving average eliminates the presence of daily price fluctuations for periods below 200 days. This smoothing effect of price change increases as investor use longer and longer periods as the average.

When calculating successive values, a new value comes into the sum and an old value drops out, meaning a full summation each time is unnecessary, in technical analysis there are various popular values for n, like 10 days, 40 days, or 200 days. The period selected depends on the kind of movement one is concentrating on, such as short, intermediate, or long term. In any case moving average levels are interpreted as support in a rising market, or resistance in a falling market.

One characteristic of the SMA is that if the data have a periodic fluctuation, then applying an SMA of that period will eliminate that variation (the average always, containing one complete cycle). But a perfectly regular cycle is rarely encountered in economics or finance.

A simple moving average is derived by calculating the average (mean) price of a security over a specified number of periods. Simple Moving Averages can be calculated can be calculated by considering either the open, high, low or close data points for the security in question. But the predominant method is to compute considering the close data point or the closing price.

A Five day simple moving average is calculated by adding the closing prices for the last 5 days and dividing the total by 5.

10+11+12+13+14=60

60/5=12

The calculation is repeated for each price bar on the chart. The averages are then joined to form a smooth curving line-the moving average line. Continuing the example, if the next closing price in the average is 15, then this new period would be added and the oldest day, which is 10, would be dropped. The new 5-day simple moving average would be calculated as follows:

11+12+13+14+15=65

65/5=13

Day	Daily Close	10-Day SMA
1	67.50	
2	66.50	
3	66.44	
4	66.44	
5	66.25	
6	65.88	
7	66.63	
8	66.56	
9	65.63	
10	66.06	66.39
11	63.94	66.03
12	64.13	65.79
13	64.50	66.60
14	62.81	65.24
15	61.88	64.80
16	62.50	64.56
17	61.44	63.94
18	60.13	63.30
19	61.31	62.87
20	61.38	62.40

Over the last two days, the SMA moved from 12 to 13. As new day are added, the old days will be subtracted and the moving average will continue to move over time. In this example, using closing prices, day 10 is the first day possible to calculate a10-day simple moving average. As the calculation continues, the newest day is added and the oldest day is subtracted. The 10-day SMA for day 11 is calculated by adding the prices of day 2 through day 11 and dividing by 10. The averaging process then moves on to the next day where the 10-day SMA for day 12 is calculated by adding the prices of day 3 through day 12 and dividing by 10. The chart above is a plot that continues the data sequence in the table. The simple moving average begins on day 10 and continues.

Exponential Moving Average

In statistics, Exponential Smoothing is a technique that can be applied to time series data, either to produce smoothed data for presentation, or to make forecast. The time series data themselves are a sequence of observations. The observed phenomenon may be an essentially random process, or it may b an orderly, but noisy, process. Whereas in single Moving Averages the past observations are weighted equally, Exponential Smoothing assigns exponentially decreasing weights as the observation get older.

In all cases a moving average lags behind the latest data point, simply from the nature of its smoothing. An SMA can lag to an undesirable extent, and can be disproportionally influenced by old data points dropping out of the average. This is addressed by giving extra weight to more recent data points, as in the weighted and exponential moving averages.

To construct the exponential moving average (EMA), the latest data is multiplied by an exponential percentage thus giving greater weight to the most recent data. The formula for an exponential moving average is:

EMA (current) = [(Price (current) – EMA (previous day)) * Multiplier] + EMA (previous day)

Multiplier = 2 / (N+1)

A "Multiplier" is used to express the degree of weighing decrease, where N is the specified number of periods. The exponential moving average is more sensitive and moves very close to the stock price, as the greater percent of weight is given to the recent data.

An exponential moving average (EMA), sometimes also called an exponentially weighted moving average (EWMA), applies weighting factors which decrease exponentially. The weighting for each older data point decreases exponentially, giving much more importance to recent observations while discarding older observations entirely.

Calculation of EMA is a little complex compared to the SMA. The important thing to keep in mind is that the exponential moving average puts more weight on recent prices. Obviously, it will react quicker to recent price changes than a simple moving average. The formula is,

For example, a 10-period EMA's Multiplier is calculated like this:

2 / (Time periods + 1) = 2 / (10 + 1) = .1818 = 18.18%

This shows that a 10-period EMA is equivalent to an 18.18% EMA.

EMA due to its more sensitivity to recent price movements is often preferred by most technical analysts for predicting short term trends. Similarly, SMA is often preferred by most technical analysts for predicting medium to long term trends of a security.

Moving Average Convergence and Divergence (MACD)

MACD is unique in that it has lagging elements as well as leading elements. Moving averages are lagging indicators and would be classified as trend-following or lagging elements.

However, by taking the differences in the moving averages, MACD incorporates aspects of momentum or leading elements. The difference between the moving averages represents the rate of change. By measuring the rate-of-change, MACD becomes a leading indicator, but still with a lag. With the integration of both moving averages and rate-of-change, MACD has forged a unique spot among oscillators as both a lagging and a leading indicator.

A trend-following momentum indicator that shows the relationship between two moving average of prices. The MACD is calculated by subtracting the 26-day exponential moving average (EMA) from the 12-day EMA. A nine-day EMA of the MACD, called the "signal line", is then plotted on top of the MACD, functioning as a trigger for buy and sell signals.

Gerald Appel developed the Moving Average Convergence-Divergence (MACD) Indicator, and has written twelve books relating to investment strategies, including Winning Market Systems, Double Your Money Every Three Years, Stock Market Trading Systems, The Big Move. New Directions in Technical Analysis (co-author, Dr.Martin E.Zweig), and Time-Trend III. In addition, Gerald has had many articles published in such publications as Money, Barron's, and Stocks and Commodities magazines. He has also produced and appeared in a number of videotapes related to technical investment strategies. Gerald has presented at a number of seminars within the United States and abroad, and has appeared on "Wall Street Week" with Louis Rukeyser and is a frequent guest on other television programs on the financial news networks and elsewhere.

Mr.Appel published frequently in the 1970s & 1980s, in a time when computerized tools became available to professional investors but were much less accessible to retail investors. As computerized technical analysis relies on back-testing, it is not surprising that strategies announced year-by-year by Mr.Appel become vulnerable, year-by-year, to failure, as "past results do not guarantee future success". Nevertheless, the author's research has been respectable & innovative.

MACD combines trend following and momentum characteristic. By comparing moving average, MACD illustrates trend following charactertics and by racking the difference of the moving average as an oscillator, MACD displays momentum Characteristics.

Moving Average of S&P CNX Nity Indices

A moving average is simply, that an average of the price of a stock over a set period of time. The benefit of using an average of the prices rather than the actual prices is the smoothing factor the average calculation incorporates into the result. By averaging the prices the impression of unusual price spikes or sudden drops are diminished and what emerges is a more stable or less volatile trend of a stock price's history.

The smooth in benefit of the average has more of an impact over longer periods of time as should be expected. The more data points that are averaged then the greater the weight of the most common price trends. So longer period averages a popular on being 200 days for instance tend to result in much smoother lines than shorter averages. In a sense the longer term averages can be seen as representing a company's long term potential, based on their historical performance and short term averages their daily or weekly trends.

The most popular method of interpreting a moving average is to compare the relationship between a moving average of the security's closing price and the security's closing price itself. A sell signal is generated when the security's price falls below its moving average and a buy signal is generated when the security's price rise above its moving average.

Moving, average (MA) can be used to identify the point at which a position buy /sell) can be initiated and the duration for which the position can be held on to. In other words, these technical tools help an investor to stay on the right side of the trend for as long as possible.

The moving average gives buy and sell signal at the apt juncture that can be used by traders and investors alike to take or pare positions.

As long as the stock price is above the MA the trend is defined as bullish. In the same way, as long as the stock price is trading below the MA, the trend is defined as bearish.

Simple moving averages are called as lagging indicators and hence work well only when the prices are trending. Otherwise they give misleading signals. The practice normally used by analysts and chartists is to follow the 10 day SMA for predicting the short them trend.

The most reliable method often followed is whenever the current price of the stock crosses the 200 day SMA it is a strong buy signal and if the price of the stock drops below the 200 day SMA it is a strong sell signal.

Since the value of the moving average line is calculated afresh for a pre-determined period with the latest data, the average "moves" over time. The moving average line helps in smoothing the data and points towards the underlying trend in the chart. Moving average is a trend following and smoothing tool.

A moving average (MA) is a calculated effort to eliminate or minimize the fluctuations of the numerical value of the phenomenon being observed so that an underlying trend may be recognized when a sequential series of that phenomenon is reviewed.

Moving Average can give signals in a number of different ways. They can identify trends, reversal points and measure market momentum and show support and resistance levels.

Moving average can be used as confirmation of a trend. For example, when the price is above the moving average and the average is in sloping upwards, this confirms that the market is in an uptrend and that the trader should be positioning their trades on the long side of the market.

Trend identification / confirmation

The first trend identification technique uses the direction of the moving average to determine the trend. If the moving average is declining, the trend is considered down. The direction of a moving average can be determined simply by looking at a plot of the moving average or by applying an indicator to the moving average.

The second technique for trend identification is price location. The location of the price relative to the moving average can be used to determine the basic trend. If the price is above the moving average, the trend is considered up. If the price is below the moving average, the trend is considered down

The third technique for trend identification is based on the location of the shorter moving average relative to the longer moving average. If the shorter moving average is above the longer moving average, the trend is considered up. If the shorter moving average is below the longer moving average, the trend is considered down.

Another use of moving averages is to identify support and resistance levels. This is usually accomplished with one moving average and is based on historical precedent. As with trend identification, support and resistance level identification through moving averages works best in trending markets.

Exponential Moving Average

The exponential moving average is consistently closer to the actual price. On average, the EMA is 3/8 of a point closer to the actual price than the SMA. The simple moving average obviously has a lag, but the exponential moving average may be prone to quicker breaks. Some traders prefer simple moving averages over long time periods to identify long-term trend changes. In addition, much will depend on the individual security in question. Moving average type and length of time will depend greatly on the individual security and how it has reacted in the past.

The initial thought for some is that greater sensitivity and quicker signals are bound to be beneficial. This is not always true and brings up a great dilemma for the technical analyst:the trade off between sensitivity and reliability. The more sensitive and indicator is, the more signals that will be given. These signals may prove timely, but with increased sensitivity comes an increase in false signals. The less sensitive an indicator is, the fewer signals that will be given. However, less sensitivity leads to fewer and more reliable signals. Sometimes these signals can be late as well.

For moving averages, the same dilemm aapplies. Shorter moving averages will be more sensitive and generate more signals. The EMA, which is generally more sensitive that the SMA, will also be likely to generate more signals. However, there will also be an increase in the number of false signals and whipsaws. Longer moving averages will move slower and generate fewer signals. These signals will likely prove more reliable, but they also may come late. Each investor or trader should experiment with different moving average lengths and types to examine the trade-off between sensitivity and signal reliability.

Moving Average Convergence and Divergence (MACD)

The study of comparing short term moving averages against long term moving averages is probably the most common approach to using the moving average indicator. In fact one of the most popular traditional indicators the MACD (Moving Average Convergence / Divergence) is based on comparisons of short term versus long term moving averages. There are some distinctions between the calculation of the MACD and comparing short term versus long term moving averages however the principle is essentially the same. The difficult part is interpreting what the average tells the investor about the stock's performance. Essentially the question is always:Does a short term average cross over a long term line signal a new break out for the stock

or will the short term trend fall back in line with the longer term trend? it's not proof, the investor still have to make own assessments, but the indicator can help the investor.

Traditionally most analysis of short term versus long term averages considers crosses, where the short term average line crosses over the long term line to most often indicate a new future trend of a stock. In other words, meaning that the longer term average will follow the direction of the shorter term moving average. In reality however this is not always the case. Often short term averages will cross the long term average only to fall back into line with the long term trend. Only the investor can determine which average indicates the true direction the stock price will take. At this point, often supporting information such as news or quarterly financial releases are used to assist in determining if the short term moving average trend is merely a market driven change or if reflects a basis for the increased value of the company.

The MACD line is calculated by subtracting a 26 day exponential moving average from a 12 day exponential moving average. When MACD has a positive value, this means that the shorter term average (the 12 day) is above the longer (26) day average. This indicates rising momentum.

The slower line, called the signal line, is a 9 day exponential moving average of the MACD line.

When two moving averages converge this indicates a possible end to the existing trend. When the moving averages diverge -i.e. there is a lot of space between them-this suggeststhat the trend is till healthy.

There are three common methods used to interpret the MACD:

a. Crossovers - When the MACD falls below the signal line, it is a bearish signal, which indicates that it may be time to sell. Conversely, when the MACD rises above the signal line, the indicator gives a bullish signal, which suggests that the price of the asset is likely to experience upward momentum. Many traders wait for a confirmed cross above the signal line before entering into a position to avoid getting "faked out" or entering into a position too early, as shown by the first arrow.

b. Divergence - When the security price diverges from the MACD. It signals the end of the current trend.

c. Dramatic rise - When the MACD rises dramatically - that is, the shorter moving average pulls away from the longer-term moving average - it is a signal that the security is overbought and will soon return to normal levels.

Traders also watch for a move above or below the zero line because this signals the position of the short-term average relative to the long-term average. When the MACD is above zero, the short-term average is above the long-term average, which signals upward momentum. The opposite is true when the MACD is below zero.

Suggestions for effective usage of moving average

The investors should note the fact that all moving averages are lagging indicators and will always be "behind" the price. The price is trending down, but the simple moving average, which is based on the previous 10 days of data, remains above the price. If the price were rising, the SMA would most likely be below. Because moving averages are lagging indicators, they fit in the category of trend following indicators. When prices are trending, moving averages work well. However, when prices are not trending, moving averages can give misleading signals.

There are some issues with moving averages; most often critics cite the lack of sensitivity to the range of the markets because the average ignores the open, high and the low of each interval. This is especially evident in more volatile stocks which can be difficult to assess when neglecting the volatility of the instrument. Other factors such as breaking news also cannot be accounted for in any technical analysis. However the effectiveness of the moving average as an indicator is apparent by its sheer sustainability, it was one of the earliest methods of analysis and remains as a key indicator for stock analysts around the globe.

To trade, survive and succeed, it is essential that the investor recognize the price patterns and trends amid the morass of seemingly unconnected change so that he can go with the tide. Tofight against it is futile, he will be swept out into the unfathomable depths and perish without sign. To this end the concept of moving averages is a very useful tool to understand.

When the moving average is lower than the previous day this signals the end of an uptrend. When the moving average is higher than the previous day this signals the end of a downtrend.

Market momentum can be measured by using multiple moving averages of different time periods and liking at the divergence between them. For example, in an uptrend, if the shorter term moving average is diverging from the longer term average - this confirms that the trend is gaining momentum.

The closing price moving above the moving average is interpreted as a buy signal. A closing price moving below the moving average is interpreted as a sell signal. This is known as the crossover rule. The moving average itself moving in the direction of the price as it crosses the moving average is confirmation of the signal.

Bear in mind that when a crossover occurs, the price does not always stay above (or below) the moving average, in an upward (or downward) crossover outlier and false signals will occur.

In the case of short time periods (such as 5 or 10 days) the MA will hug the price closer and there will be more crossings.

While the shorter time frame will produce more signals and more false signals, it will give trend signals earlier.

The signals from longer term moving averages work better while a trend is still in effect but in the event of a trend reversal a shorter term MA will work better whiel the price is in the pocess of reversing.

A trader can improve performance and avoid getting wrong signals when using the crossover rule by using additional filters. For example looking for the close to remain above or below the moving average for an additional x number of periods after the crossover occurred. Other filtering tools are considering the extent that the price went through the moving average, and looking at the volume present with the crossover taking place.

The investor should look for clear support, resistance and crossovers on th moving average intervals selected. If satisfactory results are not achieved, adjust the intervals or the time frame.

If a particular moving average is acting as support, buy orders can be placed at or near that level with stop-loss orders slightly below. If a moving average is acting as resistance, sell orders can be placed at that level with stop-loss orders slightly above. If a crossover occurs, the existing relationship, either support or resistance, is likely to reverse.

When to use Moving Average

Moving averages smooth out a data series and make it easier to identify the direction of the trend. Because past price data is used to form moving averages, they are considered lagging, or trend following. indicators. Moving averages will not predict a change in trend, but rather follow behing the current trend. Therefore, they are best suited for trend identification.

Moving averages follow the trend, they work best when a security is trending and are ineffective when a security moves in a trading range. With this in mind, investors and traders should first identify securities that display some trending characteristics before attempting to analyze with moving averages. This process does not have to be a scientific examination. Usually, a simple visual assessment of the price chart can determine if a security exhibits characteristics of tend. In its simplest form, a security's price can be doing only one of three things: trending up, trending down or trading in a range. An uptrend is established when a security forms a series of higher highs and higher lows. A downtrend is established when a security forms a series of lower lows and lower highs. A trading range is established if a security cannot establish an uptrend or downtrend. If a security is in a trading range, an uptrend is started when the upper boundary of the range i broken and a downtrend begins when the lower boundary is broken.

Once a security has been deemed to have enough characteristics of trend, the next task will be to select the number of moving average periods and type of moving average. The number of periods used in a moving average will vary according to the security's volatility, trendiness and personal preferences. the more volatility there is, the more smoothing that will be required and hence the longer the moving average. Stocks that do not exhibit strong characteristics of trend may also require longer moving averages. Trial and error is usually the best means for finding the best length. Examine how the moving average fits with the price data. If there are too many breaks, lengthen the moving average to decrease its sensitivity. If the moving average is slow to react, shorten the moving average to increase its sensitivity. In addition, the investor may want to try using both simple and exponential moving averages. Exponential moving averages are usually best for short-term situations that require a responsive

moving average. Simple moving averages work well for longer-term situations that do not require a lot of sensitivity.

Effective use of Moving Average Convergence Divergence - MACD

MACD is trend following indicator, and is designed to identify trend changes. It's generally not recommended for use in ranging market conditions. Three types of trading signals are generated :

a. MACD line crossing the signal line.

b. MACD linecrossing 0.

c. Divergence between price and histogram, or between MACD line and price.

The signal line crossing is the usual trading rule. The standard interpretation is to buy when the MACD crosses up through the signal line, or sell when it crosses down through the signal line. These crossings may occur too frequently, and other tests may have to be applied.

When the MACD line crosses through zero on the histogram it is said that the MACD line has crossed the signal line.

The histogram can also help visualizing when the two lines are coming together. Both may still be rising, but coming together, so a falling histogram suggests a crossover may be approaching.

A crossing of the MACD line up through zero is interpreted as bullish, or down throguh zero as bearish. These crossings are of course simply the original EMA (12) line crossing up or down throguh the slower EMA (26) line.

Positive divergence between MACD and price arises when price makes a new sell off low, but the MACD doesn't make a new low (ie. it remains above where it fell to on that previous price low). This is interpreted as bullish, suggesting the downtrend maybe nearly over. Negative divergence is the same thing when rising (ie. price makes a new rally high, but MACD doesn't rise as high as befopre), this is interpreted as bearish.

Divergence may be similarly interpreted on the price versus the histogram, where the new price levels are not confirmed by new histogram levels. Longer and sharper divergences (distinct peaks or troughs) are regarded as more significant than small shallow patterns in this case.

It is recommended to look at a MACD on a weekly scale before looking at a daily scale to avoid making short term trades against the direction of the intermediate trend.

Sometimes it is prudent to apply a price filter to the Bullish Moving Average Crossover to ensure that it will hold. An example of a price filter would be to buy if MACD breaks above the 9-day EMA and remains above for three days. The buy signal would then commence at the end of the third day.

Conclusion:

As their name implies, lagging indicators follow the price action and are commonly referred to trend-following indicators. Rarely, if ever, will these indicators lead the price of a security. Trend-following indicators work best when markets or securities develop strong trends. They are designed to get traders in and keep them in as long as the trend is intact. As such, these indicators are not effective in trading or sideways markets. If used in trading markets, trend-following indicators will likely lead to many false signals and whipsaws. Some popular trend-following indicators include moving averages (Exponential, simple, weighted variable) and MACD.

One of the main benefits of trend-following indicators is the ability to catch a move and remain in a move. Provided the market or security in question develops a sustained move, trend-following indicators can be enormously profitable and easy to use. The longer the trend, the fewer the signals and less trading involved.

Another drawback of trend-following indicators is that signals tend to be late. By the time a moving average crossover occurs, a significant portion of the move has already occurred. Late entry and exit points can skew the risk/reward ratio.

The investors should note the fact that all moving averages are lagging indicators and will always be "behind" the price. The price is trending down, but the simple moving average, which is based on the previous 10 days of data, remains above the price. If the price were rising, the SMA would most likely be below. Because moving averages are lagging indicators, they fit in the category of trend following indicators. When prices are trending, moving averages work well. However, when are not trending, moving averages can give misleading signals.

There are some issue with moving averages; most often critics cite the lack of sensitivity to the range of the markets because the average ignores the open, high and the low of each interval. This is especially evident in more volatile stocks which can be difficult to assess when neglecting the volatility of the instrument. Other factors such as breaking news also cannot be accounted for in any technical analysis. However the effectiveness of the moving average as an indicator is apparent by its sheer sustainability, it was one of the earliest methods of analysis and remains as a key indicator for stock analysis around the globe.

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