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INSTRUCTIONS

MODULE

TEHNICAL ANALYSIS

March 2010



МАКЕДОНСКА БЕРЗА
MACEDONIAN STOCK EXCHANGE

Instructions of module Technical analysis

“**T**echnical Analysis” module is a separate part of the services block included in the subscriber section of “Best Net Analitica”. This module has been specially designed to allow subscribers make technical analysis of companies traded on Macedonian Stock Exchange, through choice of appropriate set of indicators. Each indicator presents a kind of trading idea which may be implemented with a purpose of improving your investment process.

What is Technical analysis?

Beside fundamental analysis, technical analysis is one of the approaches in making investment decisions related to securities. Unlike fundamental analysis where financial reports, company and industry specific conditions and perspectives are basis for an in-depth analysis, the market price of securities is basis for a technical analysis. Through an ongoing valuation of companies on the market, i.e. through securities market price analysis, one may acquire useful information on the way in which the market (investors) evaluates so far operations, but even more, the way in which they evaluate company’s future prospects. Therefore, the market price is what counts in this approach, i.e. the conditions on the supply and demand side which affect its formation. Namely, technical analysis focuses in historical data of market prices of securities resulting from changes in market forces, with a purpose of identifying certain trends i.e. recognizable patterns, which, on the other side, allow evaluation of future movements. In the process of tracking changes on the supply and demand side, this analysis also takes into account irrational factors such as the general market sentiment (pessimism/optimism), or the current popularity of a certain type of investment behavior. In practice, there are several forms of technical analysis. The price history is being analyzed through:

- **Chart analysis (Chartism);**
- **Mechanic trading rules ;**
- **Technical indicators .**

Chart analysis (Chartism), as one of the ways of implementing technical analysis, includes implementation of charts which present market price movements during a certain period in the past, as a way of acquiring an idea of the behavior of certain securities, and a possibility to identify a certain rule in such behavior based on this pattern. Most popular charts among technical analysts are the head and shoulders and the moving average chart.

Mechanic trading rules, as one of the ways of implementing technical analysis, include implementation i.e. transformation of certain subjective evaluations of security movements into objective, sometimes also quantified trading rules. Examples of such mechanic trading rules are certain defined trading strategies such as: “follow the money of prudent investors”, or “opposite opinion” strategy.

Technical indicators, as one of the ways of implementing technical analysis, include certain ratios which are used for providing grounds and possibilities for detecting expected movements of security market prices. Large number of technical indicators is used in practice, and individual analysts make their own choice of those which they consider to be most adequate for practical implementation and for predicting future prices. These indicators are calculations which take into account prices and volume of individual securities and they present cash flows, trends, volatility, and momentum. They are usually used as second, additional means of presenting actual price movements, and provide additional information in security analysis. Therewith, they are used in two ways: to confirm the price movements through an appropriate chart, and to alert to buy or sell signals, and are usually referred to by technical analysts as leading indicators and lagging indicators. The leading indicators signal on the movements and circumstances in the economy before they actually appear. Having that in mind it must be mentioned that they have to be interpreted with great caution before an investment decision is made. The lagging indicators point to the movements and circumstances in the economy which have already come into existence, and they are used as a tool for confirming the trend. Beside the great number of ways of classifying these indicators, worth of mentioning is the classification which divides them into a group of indicators in which the movement limits are not strictly defined, and group of indicators with defined movement limits. The latter are also known as oscillators. Their usual range goes between 0 and 100, with signaling periods of overvalued (near 100) or undervalued securities (near 0).

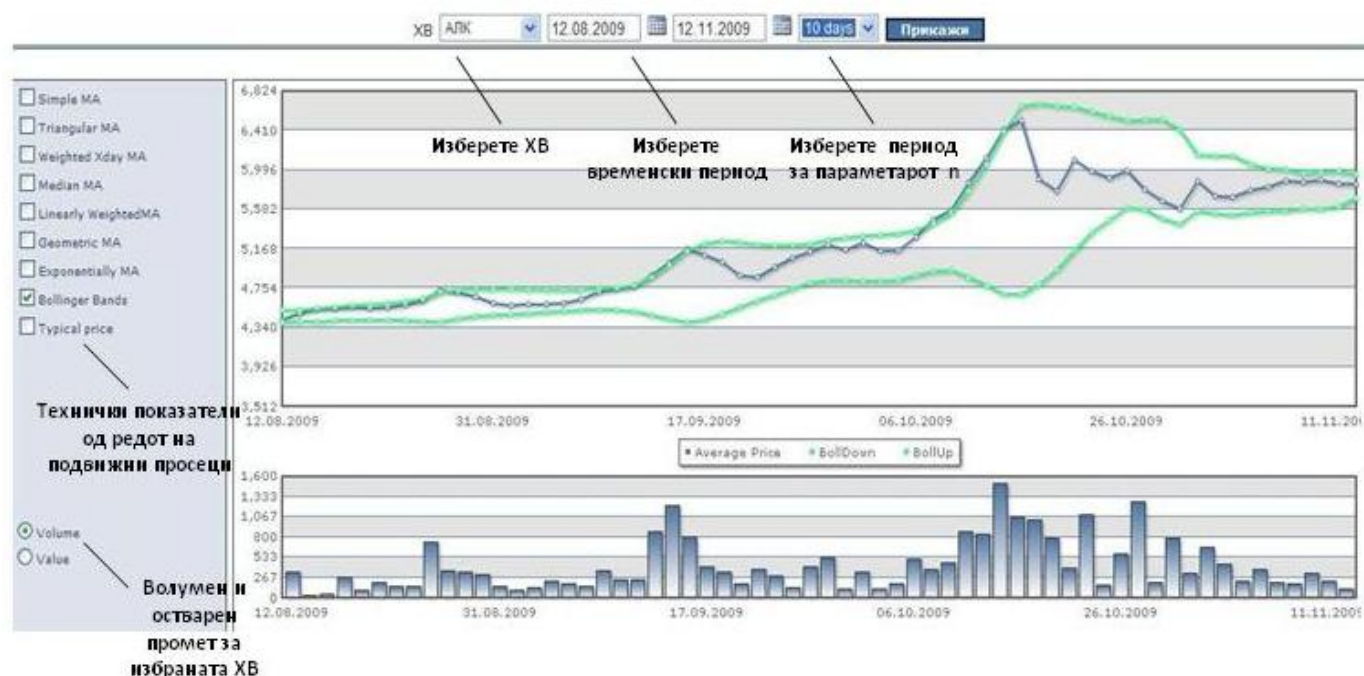
Implementing these indicators for reading buy and sell signals may be done through interpreting the intersection and the direction of their moves. Usually, most popular are interpretations of the intersection between the moving average and the price of the respective security, or the intersection of two moving averages. The second way of interpretation relates to the case when the direction of the respective indicator is opposite to the price movement of the security. In such case it may only be confirmed that the trend is weakening.

What the module "Technical Analysis" offers you?

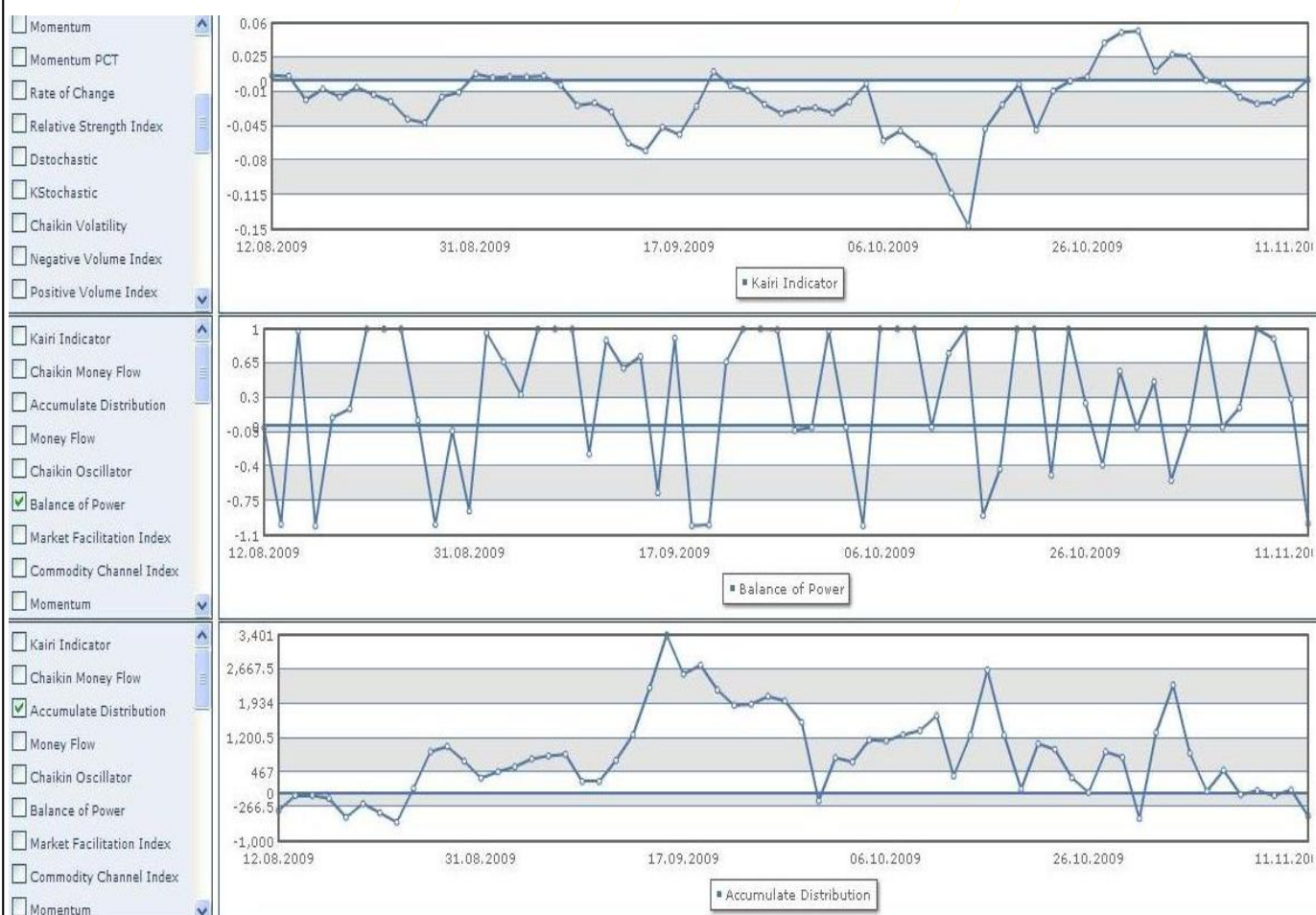
The "Technical Analysis" module, as part of the subscriber section of "Best Net Analitica", is based on graphical presentation of the technical indicators, as one of the ways of implementing technical analysis. The set of technical indicators includes over 40 indicators and oscillators, defined through their parameters. Having in mind that each technical indicator constitutes new trading idea with its limits of movement, indicators are presented by resemblance. Namely, technical indicators are presented in five different charts, where one chart may be used for simultaneous selection of indicators with similar limits of movement only. Therefore, the opening page of the "Technical Analysis" module is basically divided into two segments.

- The first segment includes the main charts, consisting of: basic chart which shows the price movements of the selected security and the technical indicators from the moving averages group,
- and adjunct chart which with the entry in this module automatically shows the volume, i.e. the traded quantity and the realized turnover of the selected security.

Within this segment, as it may be seen from the presentation itself, there is a possibility of selecting a security, a subject of analysis, and a period of time for which the technical indicator is going to be calculated and given. As a separate tab in this module, or as a separate possibility for submission, the period by which the n parameter is determined may be selected, according to which technical indicators are defined. Having in mind that for calculating technical indicators there are no strictly set rules that can define the length of this period, the choice of this parameter is left to technical analyst's estimate, as a primarily subjective beside the usual and recommended one.



The second segment included in this page allows the possibility of selecting other technical indicators and oscillators, in three separate charts. The selected security, period, and definition of n parameter, are referring to this set of charts as well. Here we shall mention again that one chart may be used for simultaneous selection of indicators with similar limits of movement only.



INDICATORS / OSCILLATORS

Simple Moving Average (SMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $MA = (P1 + \dots + Pn) / n$

Simple Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series. The simple moving average gives the same weighted value to all data in the series. **The Simple Moving Average** is one of the most com-

monly used technical tools. These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Median Moving Average (SMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $MMA = (Pm1 + \dots + Pmn) / n$

Median Moving Average - is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series.

The median is one of several measures of the middle of a data set. A **median** is described as the numeric value separating the higher half of a sample from the lower half.

Median Moving Average is one of the most commonly used technical tools. These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

X- DAY Moving Average (WMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $WMA = (Pm1 + \dots + Pmn) * xn / 1/n * w$

X-Day Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series.

X-Day Moving Average is one of the most commonly used technical tools. These types of indicators usually follow the trend and

the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

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Linearly Weighted Moving Average (LWMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $LWMA = (P_1 + \dots + P_n) * t / t$

Linearly Weighted Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series. **Linearly Weighted Moving Average** is type of moving average that assigns a higher weighting to recent price data than does the simple moving average. This average is calculated by taking each of prices over a given period and multiplying them

by its certain position in the data series.

Linearly Weighted Moving Average is one of the most commonly used technical tools. These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

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Triangular Moving Average (TMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $TMA = (P_{m1} + \dots + P_{mn}) / n$

Triangular Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series.

Triangular Moving Average is similar to exponential moving average except the different weight scheme is used. With a **Triangular Moving Average**, the majority of the weight is assigned to the middle portion of the data.

Exp. $1, 2, \dots, \frac{N-1}{2}, \frac{N+1}{2}, \frac{N-1}{2}, \dots, 2, 1$

Triangular Moving Average Average is one of the most commonly used technical tools. These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

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Exponentially Moving Average (EMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $EWMA_t = cP_t + (1 - c)EWMA_{t-1}$

Exponentially Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series.

With a **Exponentially Moving Average** the majority of the is used. With a **Triangular Moving Average**, the majority of the weight is assigned to the latest data. The weighting for each older

data point decreases exponentially, giving much more importance to recent observations while still not discarding older observations entirely.

Exponentially Moving Average is one of the most commonly used technical tools. These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

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Geometric Moving Average (GMA)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $GMA = \text{Nth root of: } (C \cdot C_1 \cdot C_2 \cdot C_3 \cdot C_4 \cdot \dots \cdot C_{(n-1)})$

Geometric Moving Average is an indicator which shows the average value of the security price in question for a selected period. The basic difference between certain types of averages is the weighted value that is given to data in the time series.

Geometric Moving Average gives the most recent observation the greatest weight, and all previous observations weights decreasing in geometric progression from the most recent back to the first.

These types of indicators usually follow the trend and the security price movements, which allow them to clearly signalize taking long or short position. For a proper interpretation it is usual to make combinations with simple moving averages, but with different period lengths. Usually buy signals are generated when short-term or medium-term average intersects the long-term one from below and are above it. Inverse situation takes place when the sell signal appears.

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Kairi Indicator

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS

FORMULA $Kairi\ Indicator = MA-price / price$

Kairi Indicator is a measure that is calculated as a percentage of the price, the divergence between the a moving average (generally the simple moving average) of the price and the price itself for each period for which there is sufficient historical values. The **Kairi Indicator** is often used with conjunction with other moving averages within trading systems.

The **Kairi Indicator** can be used in order to take advantage of an over extended trending market.

The **Kairi Indicator** could also be used in order to detect market tops and bottom. The idea being that market tops and bottoms often occur when the price is at an extreme value in relation to its moving average. That is, the Kairi Indicator should take an extreme value at market tops and bottoms.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Typical Price (TP)

DISPLAY - MAIN CHART

FORMULA $TP = High + Low + Close / 3$

Typical Price is function that measures the average of the high, low, and closing prices for the day using a simple, single-line plot. The ordinary price gives a simplified view of the day trading prices for as well as it happens with other price-adjustment

functions. The **Typical Price** indicator is measured by adding the high, low and closing prices together, and then dividing by three. These indicator is usually used as additional indicator in calculation of moving averages.

The **Typical Price** attempts to give a more real representation of where price has been by incorporating the high and low price into the most often used closing price.

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Bollinger Bands (BB)

DISPLAY - MAIN CHART

PARAMETER - NUMBER OF DAYS, STANDARD DEVIATION

FORMULA

$$UpperBB = MA + D \sqrt{\frac{\sum_{i=1}^n (y_i - MA)^2}{n}}$$

$$LowerBB = MA - D \sqrt{\frac{\sum_{i=1}^n (y_i - MA)^2}{n}}$$

Bollinger Bands consist of set of three curves drawn in relation to securities prices. The middle band is a measure of intermediate term trend, usually a simple moving average, that serves as a base for the upper band and lower band. The interval between the upper and lower bands and the middle band is determinate by

volatility, typically the standard deviation of the same data that were used for the average.

Buy and sell signals are not given when prices reach the upper or lower bands. Such levels merely indicate that prices are high or low on a relative basis. A security can become overbought or oversold for an extended period of time. Knowing whether or not prices are high or low on a relative basis can enhance our interpretation of other indicators, and it can assist with timing issues in trading. This indicator is usually combined with **Relative Strength Index**

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Relative Strength Index (RSI)

DISPLAY - ADDITIONAL CHART

PARAMETER - NUMBER OF DAYS

FORMULA $RSIt = (UT / (UT + DT)) * 100$

Relative Strength Index is an extremely useful and popular momentum oscillator, introduced in 1978.

The **Relative Strength Index** compares the magnitude of a stock's recent gains to the magnitude of its recent losses and turns that information into a number that ranges from 0 to 100. It takes a single parameter, the number of time periods to use in the calculation. If the RSI rises above 30 it is considered bullish for the underlying stock. Conversely, if the **Relative Strength Index**

falls below 70, it is a bearish signal. The centerline for **Relative Strength Index** is 50. Readings above and below can give the indicator a bullish or bearish tilt. On the whole, a reading above 50 indicates that average gains are higher than average losses and a reading below 50 indicates that losses are winning the battle. Also, buy and sell signals can also be generated by looking for positive and negative divergences between the **Relative Strength Index** and the underlying stock. Divergences that occur after an overbought or oversold reading usually provide more reliable signals.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Rate of Change (ROC)

DISPLAY - ADDITIONAL CHART

FORMULA $ROct = (Pricet / Pricen) * 10000$

Rate of Change is indicator that monitors market momentum and measures the speed at which a variable changes over a specific period of time. **Rate of Change** is first calculated by dividing the price change over the last 'n' periods by the closing price of the instrument 'n' periods ago. The result is the percentage by which the price has changed over the last 'n' periods. If the share prices increase in this period, the **Rate of Change** will be a positive number; and a negative number with decreased share prices. At the peaks, this indicator suggests a market that is over-

bought. Valleys or troughs indicate an oversold market condition. When the indicator begins to move back toward the zero line, this may indicate that the current trend is losing momentum. Some market technicians use a very simplified approach for the rate of change study. It issues buy and sell signals based upon the midpoint or zero line. You sell when the rate of change line crosses from above to below. You buy when the study crosses from below to above. This assumes that an oversold or overbought market condition precedes the crossover.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Commodity Channel Index (CCI)

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $CCI_t = (TP_t - TPAVG_t) / (.015 * MDT)$

Commodity Channel Index is a price momentum indicator designed to identify cyclical turns in commodities. **Commodity Channel Index** represents the position of current price relative to the average of price over a recent period.

Commodity Channel Index usually falls in a channel of -100 to +100. Another way of using this indicator is when index crosses the zero line.

The conventional **Commodity Channel Index** trading system works as follows:

- Commodity Channel Index over +100 - long position
- Commodity Channel Index falls back below +100 - closing long position
- Commodity Channel Index below -100 - short position
- Commodity Channel Index rises above -100 - closing short position

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

MACD

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA *OSCt is the oscillator for the current period.*
EMA1 is the first exponential moving average
EMA2 is the second exponential moving average
 $EMAosc_t = EMAosc_{t-1} + (k * (OSC_t - EMAosc_{t-1}))$

MACD (Moving Convergence or Divergence) is a momentum indicator that shows the relationship between two exponential moving averages. **MACD** is the difference between the fast and the slow moving average. The most popular is the difference between a security's 26-day and 12-day exponential moving average. Usually, a 9-day exponential moving average of **MACD** is

plotted along side to act as a trigger line.

A bullish crossover occurs when **MACD** moves above its 9-day exponential moving average, and a bearish crossover occurs when **MACD** moves below its 9-day exponential moving average.

The histogram represents the difference between **MACD** and its 9-day exponential moving average. The histogram is positive when **MACD** is above its 9-day exponential moving average and negative when **MACD** is below its 9-day exponential moving average.

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MACD Histogram

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA *OSCt is the oscillator for the current period.*
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AROON UP, AROON DOWN

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $AroonUp(n) = 100 + (100/Period) * (n - Highest(Price\ High, Period, n))$
 $AroonDown(n) = 100 + (100/Period) * (n - Lowest(Price\ Low, Period, n))$

AROON is technical indicator developed in 1995, used for identifying trends in an underlying securities and the likelihood that the trends will reverse. It is made up of two lines: one line called **AROON UP**, which measures the strength of the uptrend, and the other line is called **AROON DOWN**, which measures the downtrend.

- The plotted value is ranging from 0 to 100 - When the **AROON UP** line reaches 100 it is a sign of strength. A strong up trend is indicated when the **AROON UP** persistently remains between 70 and 100, while the **AROON DOWN** persistently remains between 0 and 30. If the

AROON DOWN line falls to 100, potential weakness is indicated. A strong downtrend is indicated when the **AROON DOWN** line persistently remains between 70 and 100 when the **AROON UP** line persistently remains between 0 and 30.

- When the **AROON UP** line and **AROON DOWN** line move parallel with each other the consolidation is indicated.
- When the **AROON DOWN** line rises above the **AROON UP** line, potential weakness is indicated. When the **AROON UP** line crosses the **AROON DOWN** line, potential strength is indicated.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

AROON OSCILLATOR

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $AroonUp(n) = 100 + (100/Period) * (n - Highest(Price\ High, Period, n))$
 $AroonDown(n) = 100 + (100/Period) * (n - Lowest(Price\ Low, Period, n))$

AROON is technical indicator developed in 1995, used for identifying trends in an underlying securities and the likelihood that the trends will reverse.

A separate indicator called **AROON Oscillator** can be constructed by subtracted **AROON DOWN** from **AROON UP**. Since **AROON UP** and **AROON DOWN** oscillate between 0 and +100, the **AROON Oscillator** will oscillate between -100

and +100 with zero as the center crossover line.

Change states that when **AROON UP** and **AROON DOWN** are moving lower in close proximity, it signals that a consolidation phase is under way and no strong trend is evident. When **AROON UP** dips below 50, it indicates that the current trend has lost its upward momentum. Similarly, when **AROON DOWN** dips below 50, the current downtrend has lost its momentum. Values above 70 indicate a strong trend in the same direction as the **AROON (UP or DOWN)** is under way.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Ease of Movement

DISPLAY - ADDITIONAL CHART

FORMULA $EMV = \frac{\frac{High(today) + Low(today)}{2} - \frac{High(yesterday) + Low(yesterday)}{2}}{Volume}$
 $\frac{High(today) - Low(today)}$

Ease of movement is technical indicator that highlights the relationship between volume and prices changes and demonstrates how much volume is needed for changing prices. This indicator also is particularly useful for assessing the strength of a trend. The indicator shows:

- High positive values when prices move upward on light volume;

- High negative values when prices move down on light volume;
- Low values if price is not moving or if it takes heavy volume to move prices, signaling distribution or accumulation.

A sell signal occurs when the indicator crosses below zero. Here prices are moving downward more easily. A purchase signal occurs when it crosses above zero. In this case prices are more easily moving upward.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Volume Oscillator

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $VO = ((Short\ MA - Long\ MA) / Short\ MA) * 100$

Volume Oscillator is technical indicator that identifies trends in volume using two moving averages. The **Volume Oscillator** measures the difference between a faster and slower moving averages. The indicator shows:

- If the short Moving average is above the long moving average the oscillator will be positive;

- If the short Moving average is below the long moving average the oscillator will be negative;
- The **Volume Oscillator** will be zero when the two moving averages cross.

Trading signals indicated that rising volume (positive **Volume Oscillator**) signals a strong trend. Falling volume (negative **Volume Oscillator**) indicates trend weakness.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Momentum

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $MOM = Price / price (n\ periods\ ago) * 100$

Momentum is technical indicator that measures the rate of change in prices and is used to detect trend weakness and likely reverse points.

High **Momentum** readings (positive or negative) occur when trend is at its strongest. Lower readings are found at the start and the end of trends. Overbought and oversold levels are set separately for each security, based on the performance of the indicator over past cycles. **Momentum** tends to stay above zero during an up trend and below zero during a down trend.

tor over past cycles. **Momentum** tends to stay above zero during an up trend and below zero during a down trend.

- Taking long position if **Momentum** turns upwards when below zero;
- Taking short position if **Momentum** turns upwards when above zero;

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

William's %R

DISPLAY - ADDITIONAL CHART

FORMULA $\%R = ((HH - Today's\ Close) / (HH - LL)) * -100$

William's %R is technical indicator that indicate oversold and overbought levels. This indicator is plotted using negative values ranging from 0 to -100, with readings from 0 to -20 considered overbought, and readings from -80 to -100 considered oversold.

William %R shows the relationship of the close relative to the high-low range over a set period of time. The nearer the close is

to the top of the range, the nearer to zero (higher) the indicator will be. The nearer the close is to the bottom of the range, the nearer to -100 (lower) the indicator will be. If the close equals the high of the high-low range, then the indicator will show 0 (the highest reading). The time frame and number of periods will likely vary according to desired sensitivity and the characteristics of the individual security.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Balance of Power

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $BOB = (CL - OP) / (HI - LO)$

Balance of Power is technical indicator implemented in 2001 and measures the strength of the bulls vs. bears by assessing the ability of each to push price to an extreme level. The **Balance of Power** oscillates between extremes of -1 and +1. **Balance of Power** values can be optionally smoothed using any moving

average type, and can be drawn as a line of histogram. During bull market, its tops often reach the upper limit and never reach the bottom level. During the bear markets, the picture is reversed. A change in the **Balance of Power** trend serves as warning signal and should be confirmed by a change in a price direction.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Market Facilitation Index

DISPLAY - ADDITIONAL CHART
PARAMETER - NUMBER OF DAYS

FORMULA $MFI = (high - low) / volume$

Market Facilitation Index function determines the efficiency of price movement by analyzing the amount that the price is changing for each unit volume. It does not include any information concerning the direction of price changes. The value of this indicator is the difference between the high and low prices divided by the volume. Therefore it may be necessary to multiply it by large value, such as 10000 to see the significant digits. Changes in the value of this index are typically compared to changes in volume to determine the interest that the market has in the current price trend.

- Index increase, volume increases, the movement has begun and the number of players coming into the market increases;
- Index falls, volume falls, market participants are not interested anymore;
- Index increase, volume falls, market is not supported with the volume from clients, and the price is changing to traders' "on the floor" speculations;
- Index falls, volume increase, there is a battle between bulls and bears, characterized by a large sell and buy volume, but the price is not changing significantly since the forces are equal;

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Stochastic Oscillator %K, %D

DISPLAY - ADDITIONAL CHART

$$\left(\frac{LastClose - Lowest\ low\ over\ periods}{Highest\ high\ over\ periods - Lowest\ low\ over\ periods} \right) \times 100$$

FORMULA MA over the specified period

Stochastic Oscillator calculates the difference between the current closing price of a security and its lowest low price, relative to the its highest high price for a given period of time. The value of the stochastic oscillator is called its %K line. The moving average of this value is called its %D line. As the Stochastic Oscillator is

both a momentum indicator, and an overbought / oversold indicator, it can be used with both trending and ranging markets, and can be used in both short and long term timeframes. There are several ways of interpreting the Stochastic Oscillator during trading. One of the most popular ways is to enter a long trade when the stochastic line crosses above the signal line, and enter a short trade when the stochastic line crosses below the signal line. Long signal could be generated when the %K line falls below 20 and an enter short signal could be generated when the %K line rises above 80.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Money Flow Index

DISPLAY - ADDITIONAL CHART

FORMULA $\text{Typical Price} = (\text{High} + \text{Low} + \text{Close}) / 3$
 $\text{Money Flow} = \text{Typical price} * \text{Volume}$
 $\text{Money Ratio} = \text{Positive Money Flow} / \text{Negative Money Flow}$

Money Flow Index is a momentum indicator that is similar to the Relative Strength Index in both interpretation and calculation. However, **Money Flow Index** is a more rigid indicator in that it is volume-weighted, and is therefore a good measure of the strength

of money flowing in and out of a security. It compares "positive money flow" to "negative money flow" to create an indicator that can be compared to price in order to identify the strength or weakness of a trend. A stock is considered "overbought" if the **Money Flow Index** reaches 80 and above (a bearish reading). On the other end of the spectrum, a bullish reading of 20 and below suggests a stock is "oversold".

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

TRIX

DISPLAY - ADDITIONAL CHART

FORMULA 1. $\text{EMA1} = \text{EMA}(\text{Close})$
 2. $\text{EMA2} = \text{EMA}(\text{EMA1})$
 3. $\text{EMA3} = \text{EMA}(\text{EMA2})$
 4. $\text{TRIX} = (\text{EMA3}[\text{today}] - \text{EMA3}[\text{yesterday}]) / \text{EMA3}[\text{yesterday}]$

TRIX is a momentum indicator that displays the percent rate-of-change of a triple exponentially smoothed moving average of a security's closing price.

A positive **TRIX** is thus akin to a positive trending price, allowing the indicator to act as a buy signal whenever it crosses up above the zero line. Similarly, crossing below the zero line suggests

the price is tending to close down at the end of each period, which can be a sell signal.

Also buy signal is triggered when **TRIX** crosses above its signal line, and a sell signal is triggered when **TRIX** crosses below its signal line. This method can generate false signals during sideways price movements, so it works best when prices are trending. It is therefore wise to use **TRIX** in tandem with other indicators for confirmation.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

True Range

DISPLAY - ADDITIONAL CHART

FORMULA $\text{True Range} = \text{MAX}(|\text{High}(\text{today}) - \text{Low}(\text{today})|, |\text{Close}(\text{yesterday}) - \text{High}(\text{today})|, |\text{Close}(\text{yesterday}) - \text{Low}(\text{today})|)$

True Range is technical indicator and measure for a volatility. It does not indicate price direction or duration, rather than degree of price movement. This measure can be smoothed to give an **Average True Range**. A **True Range** can be smoothed using a variety of moving averages. Also **True Range** is used as a base for calculation of **Directional Movement System** and **Average True Range**. **Average True Range** can be interpreted using the same techniques that are used with the other volatility indicators.

True Range is calculated as the greater of:

- The difference between the current high price and the current low price;
- The difference between the current high price and the previous close price;
- The difference between the current low price and the previous close price;

The **Average True Range** is calculated by taking an average of the true ranges over a set number of previous periods..

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Positive Volume Index (PVI)

DISPLAY - ADDITIONAL CHART

FORMULA
$$PVI(today) = (Close(today) - Close(yesterday)) / Close(yesterday) * PVI(yesterday) + PVI(yesterday)$$

Positive Volume Index and **Negative Volume Index** functions determines the trend in market prices when volume increasing/decreasing.

Positive Volume Index measures the trend in market prices when volume increasing, when less informed investors are trading. **Negative Volume Index** measures the trend in market prices

when volume decreasing.

The Positive Volume Index is based on the theory that informed investors are trading on days of lower volume, while the informed crowd is participating on days of trading volume. This is similar logic to the **Negative Volume Index**, which tracks changes on lower volume days. However, where that indicator follows 'smart money', this the **Positive Volume Index** follows the 'crowd'. This means that this two measures track different segments of the trading public.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Negative Volume Index (NVI)

DISPLAY - ADDITIONAL CHART

FORMULA
$$NVI(today) = (Close(today) - Close(yesterday)) / Close(yesterday) * NVI(yesterday) + NVI(yesterday)$$

Positive Volume Index and **Negative Volume Index** functions determines the trend in market prices when volume increasing/decreasing.

Positive Volume Index measures the trend in market prices when volume increasing, when less informed investors

Increases in the indicator reflect increased volatility in the stock price which potentially signals the end of a price trend. The indicator will peak when the stock price reaches a

are trading. **Negative Volume Index** measures the trend in market prices when volume decreasing.

The Positive Volume Index is based on the theory that informed investors are trading on days of lower volume, while the informed crowd is participating on days of trading volume. This is similar logic to the **Negative Volume Index**, which tracks changes on lower volume days. However, where that indicator follows 'smart money', this the **Positive Volume Index** follows the 'crowd'. This means that this two measures track different

Chaikin Volatility (CVO)

DISPLAY - ADDITIONAL CHART

FORMULA
$$EMAHL = n \text{ period exponential moving average of } (high - low)$$

$$ChaikinVolatility = \frac{(EMAHL - EMAHL_{[-n]})}{EMAHL_{[-n]} \times 100}$$

Chaikin Volatility is technical indicator that measures the volatility, using the percentage change in a moving average of the high versus low price over given period of time. The **Chaikin Volatility** Indicator is constructed as the difference between a moving average of high-low price range today versus the high-low moving average n days ago. Increases in the indicator reflect increased volatility in the stock price which poten-

tially signals the end of a price trend. The indicator will peak when the stock price reaches a new high or a new low.

Interpretation of **Chaikin Volatility** is:

- An increase in the volatility of **Chaikin Volatility** indicator within a rather short time period demonstrates the proximity of a bottom;
- Volatility of **Chaikin Volatility** indicator decrease within a longer time period shows a close top.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Chaikin Oscillator

DISPLAY - ADDITIONAL CHART

FORMULA $(3 \text{ Period EMA of ACDI Line}) - (10 \text{ Period EMA of ACDI Line})$

Chaikin Oscillator is a volume indicator which is based upon a moving average of the Accumulation-Distribution indicator. **Chaikin Oscillator** is created by subtracting one exponential moving average of the accumulation distribution indicator (e.g.

10 day average) from another EMA of the same line (e.g. 3 day average).

The usefulness of the oscillator is in determining whether there is divergence between the direction of the stock price and the oscillator or whether the oscillator confirms the price movement. Long positions are opened when bullish divergence occurs while short positions are opened when bearish divergence occurs.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Chaikin Money Flow

DISPLAY - ADDITIONAL CHART

FORMULA $\text{sum}((((C-L)-(H-C)) / (H-L)) * V, 21) / \text{sum}(V, 21)$

Similar as **Chaikin Oscillator**, developed by Marc Chaikin, **Chaikin Money Flow** is technical indicator based on **Accumulation/Distribution Line**. The **Chaikin Money Flow** indicator is intended to show whether a given equity is within a buying trend (money flow in) or a selling trend (money flow out). The indicator is constructed by comparing the closing price to the daily high/low range and then comparing this result to the total volume.

A positive **Chaikin Money Flow** indicates that the stock is strong while a negative **Chaikin Money Flow** indicates that the stock is weak. The **Chaikin Money Flow** indicator rising above or falling below may indicate a shift in the overall trend for the equity. The **Chaikin Money Flow** takes one input parameter which is the period over which the **Chaikin Money Flow** is computed.

When a divergence between the **Chaikin Money Flow** indicator and price happens, the price trend line is expected follow the Chaikin Money Flow trend line.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Plus Directional Indicator & Minus Directional Indicator

DISPLAY - ADDITIONAL CHART

FORMULA $PDI = PDM/TR$
 $MDI = MDM/TR$

Plus Directional Indicator function determinates the momentum of positive changes that contribute to the overall price trend. **Plus Directional Indicator** is primarily moving average of the change in the high price divided by an moving average of **True range**. **Minus Directional Indicator** function determinates the momentum of negative changes that contribute to the overall price trend.

Plus Directional Indicator determinates the momentum of positive changes that contribute to the overall price trend. It can also considered to measure the percentage of price changes involved in a upward trend. **Minus Directional Indicator** is primarily moving average of the change in the low price divided by an moving average of **True range**. **Minus Directional Indicator** determinates the momentum of negative changes that contribute to the overall price trend. It can also considered to measure the percentage of price changes involved in a downward trend.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.



Directional & Average Directional Indicator

DISPLAY - ADDITIONAL CHART

FORMULA
$$DX = 100 \left(\frac{PDI - MDI}{PDI + MDI} \right)$$

$$ADX = EMA(DX)$$

The **Directional Indicator** and **Average Directional Index** is a momentum indicator which attempts to quantify the trending or directional behavior of a market. It is one of the best trend following indicator in technical analysis.

The **Average Directional Index** is a combination of two other indicators developed by Wilder, the positive directional indicator (abbreviated +DI) and negative directional indicator (-DI). The **Average Directional Index** combines them and smoothes the result with an exponential moving average.

One of the most important things which need to be kept in mind in using this indicator is that it is best implemented on markets showing a trend with significance.

Напомена

Наведеното упатство не претставува препорака за купување или продавање на хартиите од вредност. Овој модул претставува можност за дополнителна анализа кој се користи од страна на корисникот на "Бест Нет Аналитика" пакетот и секој одлука донесена од страна на истиот е негова лична одговорност.

За детално објаснување и толкување консултирајте стручна литература.

При користење на наведените индикатори, како што е наведено кај секој од нив поединечно потребно е да се препознае трендот т.е. да постои доволно ликвиден пазар за конкретната хартија од вредност. Треба да се има предвид дека толкувањето на некои индикатори може да даде погрешни сигнали доколку нема изразен тренд за истите.

