

Analysis Tools

Technical tool for analysis

The various methods of analysis provided by «Analysis Tools» are reputed world-wide for their efficiency and commonly used by portfolio-management professionals. The toolkit will provide you with significant support in your investment decisions and this powerful application's user-friendliness and simplicity of execution will amaze you.



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Introduction

1 Introduction

The Swissquote « **Analysis Tool** » allow you to track and analyse share price developments since 1998.

You will have access not only to historical prices but also to intraday data that are continuously updated.

The successful analysis of time series on the basis of so-called technical indicators requires a certain amount of familiarisation and experience. Therefore, we recommend that apart from using these guidelines you also attend our seminars.

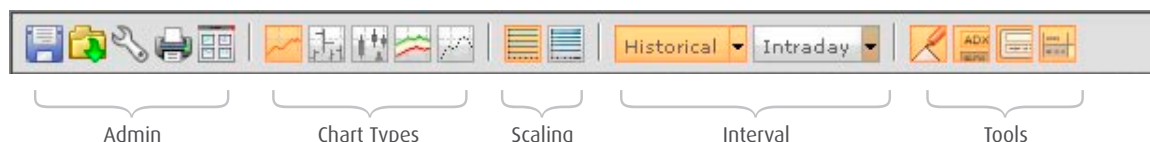
2 User Interface

In this chapter, we would like to familiarise you with the user interface of the « **Analysis Tools** ». When you open the application a window appears that resembles the one shown in « **Figure 1: The User Interface** ».



Figure 1: The User Interface

When you look at the icon bar you will see it is divided into five sections:

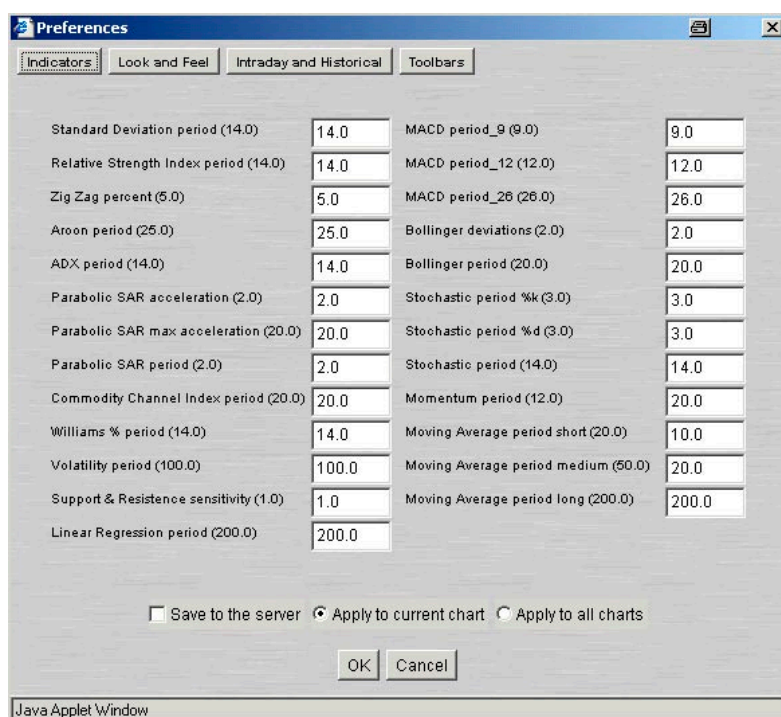


2.1 Admin

In order to **save** your graphs or your work area you can use the disc symbol in the admin section. When you want to call up saved charts just click on the Open icon (yellow binder). This opens a further template mask that closely resembles the structure of Windows Explorer. You can later find your saved data sets under the various binders (work area, graphs, Personal Pages, Portfolio Managers, etc.). Again clicking on the icon will close the template. Any work areas or graphs saved here can be deleted by pressing the CTRL und backspace keys simultaneously.

You can also apply a number of **default settings** by clicking on the icon that looks like a spanner: Under **Indicators** you can set the parameters of individual mathematical indicators according to your investor profile. We will explain the effects of changing any given parameter in the section on technical indicators.

Within the **configuration** mask you can adjust the graphic appearance of your Analysis Tools. However, the standard settings are already very user friendly.



In the menu **Intraday and Historical** you can pre-define the default settings for future chart analyses, as for example, the default settings for technical indicators or time horizons. Within the **Toolbars** template mask you can further add which instruments and icons (drawing tool, indicators, stock search and legend) should always appear in the Analysis Tool.

Changes to the default settings can only be applied either to the current graph or to all graphs that are open. If you want to save your default settings permanently, you can store these on the server.

To **print** your graph, use the printer symbol. You can also choose to save your graph locally as a file.

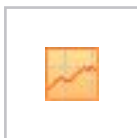
The final icon in the admin area, the **Window Button**, allows you to open up to six graphs simultaneously. This application is called the work area¹. By double-clicking

on one of the grey headers you can maximise the selected window. By double-clicking again you return to the overview. It is also possible to open a new window by pressing « shift » and « enter » at the same time in the securities search box.

¹ A work area is comparable to a folder in your operating system, in these work areas you can save up to six securities

2.2 Chart types

In this section, we will provide you with an overview of the chart types used in practice.



Line Chart:

Line charts only show the closing price for each consecutive day. This assumes that the chartists see the closing price as the most important price of a trading session.



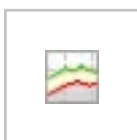
HLOC-The Bar Chart:

HLOC stands for « High/Low/Open/Close ». In this type of chart, a vertical bar illustrates the volatility of each day. The small horizontal line to the right of the bar is the closing price and the line to the left of the bar is the opening price, with the respective end points representing the highest and lowest prices.



Candlestick:

The Japanese version of the bar chart provides the same information as the classic HLOC but displays it differently. In the Swissquote Analysis Tool a **red** bar signifies that the closing price is **lower** than the opening price and a **green** bar that the closing price is **higher** than the opening price. The thin lines at each end of the bar represent the volatility between the highest and lowest price. This chart type is especially popular among day traders.



Highest-Lowest:

By connecting the highest and lowest prices during a specific time period the chartist obtains a clear picture of the volatility, which is very helpful in determining entry and exit points¹.



Point:

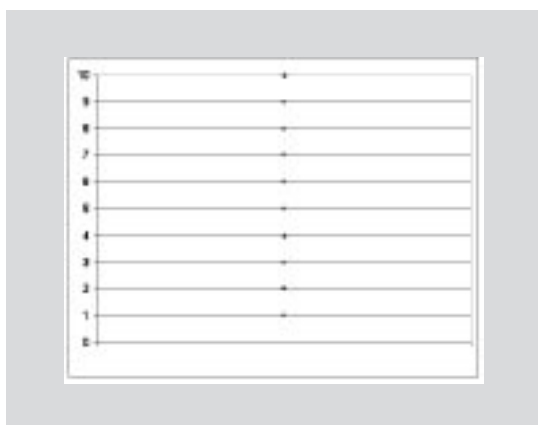
Instead of connecting the closing prices in the desired time period, prices are plotted as individual points. This leaves room for interpreting the price development between two points without assuming any linear connection. In the case of intraday graphs, lines representing the highs and lows are also drawn in the point chart.

¹ Also known as trigger level

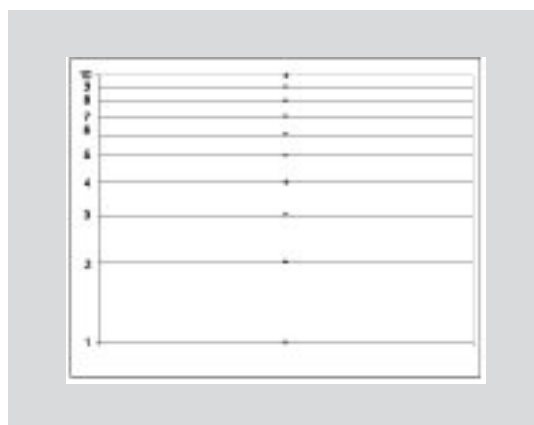
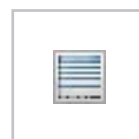
2.3 Scaling

When it comes to scaling you can choose between arithmetic and logarithmic options. A short example will clarify the difference between the two displays:

Arithmetic Display



Logarithmic Display



In arithmetic scaling, the vertical price scale shows equal distances for equal price units. But in logarithmic displays the distances shrink. The reason for this is that percentage-wise the increases become smaller. For example, the increase from 1 to 2 in percentage terms is 100% and from 5 to 10 it is also 100%. It follows that the difference between 1 and 2 and between 5 and 10 is the same, which is shown in the graph on the right side. Logarithmically, the increases are viewed in terms of percentages and the differences between values are displayed accordingly.

2.4 Interval

Depending on the time period to be analysed, you can set historical as well as intraday time series within the Analysis Tool.

Under the drop-down menu **Historical** you can set the **period** as well as the **frequency**. By default, prices are indicated on a daily basis, but they can also be listed on a weekly, monthly, quarterly, semi-annual and annual basis. Once this has been defined, the user can decide how far back the historical data should go.

The same applies to settings in the **intraday** area (within one day to no more than five days). Here too the chartist can determine the period and the frequency, as well as determine both criteria manually (entry field).

A quicker way of setting time periods is to click and hold down the left mouse button within the graph at the start of the desired period and release it once the mouse has been moved all the way to the end of the period. In addition, there is a « + » and « - » icon to the left of the horizontal scrollbar with which you can also easily lengthen or shorten the time period. By right-clicking the mouse inside the graph you can return to the previous display. By simultaneously using the CTRL and the « + » or « - » button on the lower corner of the left hand side you can manually enlarge the time line of the graphic in order to draw into the future.

2.5 Tools

Under Tools there are four further functions, explained below (from left to right).

The **Drawing Tool** allows you to draw formations und thereby determine price targets graphically. Most of the buttons of the drawing mode have to be selected before you can use their function. They cannot be used simultaneously. Each button can be selected by a simple « click ». In order to annul the selection, just click again on the same button or chose another action. If no button has been selected, you can shift the lines and segments that have already been drawn. Furthermore, the eye symbol allows you to view or hide markings made by you and to insert different so-called Fibonacci Retracements. The geometric shapes and text fields can be changed in terms of line type, script-, line- and background colour.

The icon further right allows you to activate the list of **Technical Indicators**. We will come back to these in more detail in a later chapter.

In the entry field of the **Securities Search Function** you can define the security you would like to analyse. After entering the ISIN- or Swiss security code, for example, it is enough to press ENTER for the requested instrument to come up. If you are searching for a security that is not traded on the Swiss stock exchanges then you need to define the market as well. This selection can be made, for example, by entering the security's symbol followed by a comma and the abbreviation of the trading location (« u » for USA, « ff » for Frankfurt, etc)¹

The mask further allows you to compare several graphs in one window in order to see positive or negative correlations, for example. We recommend setting the scaling to « logarithmic » if you are overlaying several graphs.

¹ Further abbreviations can be found on our homepage; Help>>Services and Tools>>Enter Stock Request

Depending on the observed frequency, the **Legend** icon allows you to view or hide the saved price data in the bottom part of the tool. This gives you direct insight into pricing information, like opening, closing, highest and lowest price, as well as trading volume for the chosen time period.

In the bottom right area of the Analysis Tool (next to the horizontal scrollbar) there is another legend symbol that gives you access to prices in table form up to 65 days in the past.

2.6 Trade it

In the top section of the Analysis Tool you will find the **Trade it** button that will take you directly to the trading mask. Once you have researched your desired security with the help of the Analysis Tool you can enter it directly into the trading mask with **Trade it** without any further detours.

3. Technical Indicators

Before we start looking at individual indicators in detail, we would like to give you a brief introduction into the theory of technical analysis.

3.1.0 Basic principles and theory of technical analysis

The essential characteristic of technical analysis is the belief that the market price is an up-to-date reflection of everything that may have an influence on the price - fundamentally, politically, psychologically or otherwise. It follows that all you need to do is investigate the price movement, nothing else. Therefore, followers of this theory are not interested in the reasons why prices rise or fall but merely in the development of trends. The trend concept is absolutely essential. Prices move according to trends. Therefore, you follow an existing trend until this trend shows signs of reversing. Hence, the key to understanding the future lies in studying the past, or the future is a repetition of the past. This may seem illogical and possibly incorrect in terms of fundamental analysis and the Random Walk Theory, but experience has shown that technical analysis in particular is very successful at signalling trends and trend reversals early on and that in the end, fundamental analysis explains and reinforces the discernible trend.

To the layman, market movements appear to be random, but the illusion of randomness vanishes bit by bit as the skill of reading charts increases.

3.1.1 Trend-Following Indicators and Oscillators

We differentiate between several types of indicators. In this handbook, we mainly focus on the so-called lagging, or trend-following, indicators and oscillators.

Trend-following indicators indicate the prevailing trend. They usually include smoothing components to prevent them from being affected by every single price fluctuation, which means that the price needs to undergo sharp movements before the trend-following indicator changes course.

In the case of oscillators, we are dealing with leading indicators that signal a future trend. The term oscillation describes a regular fluctuation. Oscillators are indicators that fluctuate above or below a centre line or between set levels or a combination of both. Extreme readings are interpreted as either over-bought or over-sold scenarios.

3.1.2 ADX - Average Directional Index

The ADX is an oscillator and therefore a trend-confirming indicator. Unlike Aroon (3.1.16), it assesses the strength of the current trend and therefore is often used in automated or electronic trading systems as a filter for sideways movements.

The ADX fluctuates between values of 0 and 100, but readings above 60 are very rare. A number of conclusions can be drawn from analysing the value range. Readings above 40 indicate a strong trend and readings under 20 indicate a weak trend. We would like to point out yet again that the ADX does not give any information about the direction of the actual trend (bullish or bearish) but merely assesses the strength of the current trend. However, ADX readings below 15 signal a sharp movement or a change in trend in either direction, thereby partly signalling the shift from a sideways trend to a new trend. In summary, we can say that a strong downward trend, as well as a strong upward trend, will be indicated by a rising ADX.

Looking at « Figure 2: ADX », we will use the performance of the DaimlerChrysler stock in 2005 as a concrete example to explain the ADX curve. The red lines indicate an upward movement, the green lines a downward movement and the blue lines a sideways movement¹. Looking at the first red trend line you can clearly see on the lower blue ADX curve a rise above 30. A small dip slightly weakens the ADX. After the second turning point, however, the ADX falls below the 30 mark toward 15, which signals a sideways movement that is represented by the horizontal blue trend line in the upper graph.



Figure 2: ADX

¹ see the upper section of « Figure 2: ADX »

[> summary](#)

The transition to a downward trend is then signalled by a rising ADX reading until the next sideways movement. Please note, however, that there is a delay in the reaction of the ADX curve. As a trend-confirming indicator it fully accomplishes its task.

The ADX is ideally suited as a filter for sideways movements. A reading of 30 is often used as a threshold. All ADX readings below 30 indicate a sideways movement. A reading of 25 is mostly used as a guideline.

Next to the blue ADX line there are two further curves which measure the strength of the upward and downward movements:

- Positive Directional Indicator DI+ (green)
- Negative Directional Indicator DI- (red)

These complement the ADX curve and serve to determine buy and sell signals. Theoretically, trading signals are generated at every point where the DI- and the DI+ curve intersect. In general, a DI+ curve that lies above the DI- curve constitutes a buy signal and a DI- that lies above the DI+ curve constitutes a sell signal. Be careful, however, as this rule does not apply in the case of sideways movements in particular. Therefore, it is advisable to consult further technical indicators before making a buy or sell decision.

3.1.3 MOM – Momentum

The Momentum indicator is another oscillator that measures the speed of price movements instead of the actual price level. The market momentum is established by continuously measuring price differences for a fixed time period. In mathematical terms, this means that in the case of a 10-day momentum, for example, you subtract the closing price from 10 days ago from the current closing price. The length of the chosen period n is up to the individual technical analyst.

When the current price is higher than the price in the past then the Momentum is positive and vice versa. This positive or negative reading is plotted on a graph above or below a zero line. As far as interpreting the indicator, we can simplify and say that as a result of the price fluctuations the Momentum oscillator allows you to analyse within a given time period the rate of incline or decline. When prices rise and the Momentum line is above the zero line and still rising we can conclude from this that the uptrend is accelerating. When, on the other hand, the upward pointing Momentum line flattens then the gains created by the latest prices correspond to the gains that were achieved 10 days (if $n=10$) ago. If the Momentum line begins to fall in direction of the zero line then the price uptrend is still intact but the incline is decreasing. The uptrend is losing momentum. If the Momentum line falls below the zero line then the current closing price is below the closing price of 10 days ago and a temporary downtrend is starting. If the line falls farther below zero then the downtrend gains momentum. Only when the line begins to rise again, does the analyst know that the downtrend is slowing.

Using our DaimlerChrysler time series (Figure 3 : MOM) as an example, we want to show how buy and sell signals can be generated. When the Momentum line intersects the zero line from above this is theoretically a sell signal. If the Momentum curve intersects the zero line from below this is a buy signal. But it is important that these decisions are taken within the framework of an existing up or downtrend. You should only take up short positions if the zero line is intersected from above by the Momentum line and a downtrend is taking place at the same time. And finally, there is also the question of proportionality. When is the momentum line too high and how low is low? In this respect, it is useful to look at the line over a long time period to allow for comparison. To improve visualisation, limits can be added by inserting horizontal lines that help to better assess extreme areas.

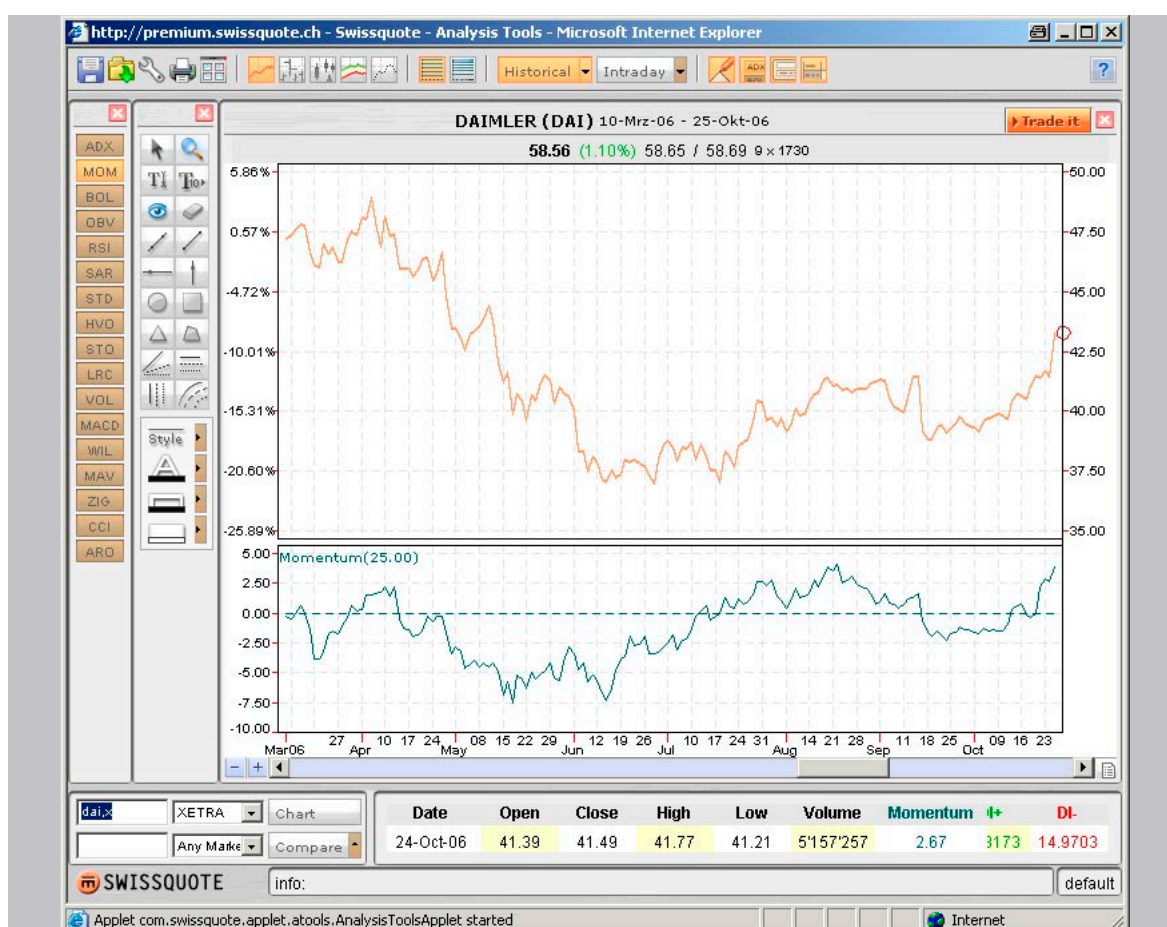


Figure 3 : MOM

3.1.4 BOL – Bollinger Bands

Bollinger Bands are a very versatile tool that combines moving averages with standard deviations. For this reason, they are one of the most widely used technical concepts¹. The moving average is placed between so-called percentage bands, which can help to determine when a market is over-stretched in one or the other direction. They tell us when a price has moved too far from its moving average. With the Bollinger Bands, the percentage bands are arranged in such a way that the space between the two trading bands encompasses 95% of all price data². Prices are considered over-stretched to the top (over-bought) when they touch the upper band and over-stretched to the bottom (over-sold) when they touch the lower band. This means when prices bounce off the lower band to rise above the moving average, the upper band becomes the price target. Intersecting the moving average downward identifies the lower band as the price target. In the case of a strong uptrend, prices will usually fluctuate between the upper band and the moving average. In this scenario, intersecting the moving-average line downward signals a shift to a downtrend.

The preceding explanation is Bollinger's personal interpretation.



Figure 4: Bollinger Bands

¹ Moving averages are arithmetic tools observed over a given time period. The standard deviation is obtained by calculating the square root of the volatility that quantifies the fluctuations around the mid-point.

² If 95 % of price data are covered, we speak of using 2 standard deviations (assuming normal distribution).

Further conclusions can be drawn by interpreting the distance between the Bollinger Bands. This can be especially useful in the case of options strategies. Depending on changes in volatility, the distance between the bands increases or decreases. The bigger the price fluctuations the wider apart the bands move. This could be the right moment to sell options because it has been shown historically that periods of high prices and volatility are highly likely to be followed by consolidation. Hence, the opposite scenario constitutes a buy signal. The reason options trading is specifically mentioned in this context is that volatility is a deciding factor for determining an over- or under-valuation in comparison with options prices.

As you study Bollinger Bands, you will notice that there are many ways to interpret them. You can also define your own parameters of interpretation. In fact, this is recommended. Should you do this, it is important to maintain the same form of interpretation in order to ensure trading decisions are consistent.

3.1.5 OBV – On Balance Volume

In this section, we will look at the meaning of volume in terms of technical analysis. The volume level measures the intensity or urgency of a price movement. By tracking the size of the volumes together with the price movements the chart analyst is able to evaluate the buy or sell pressures that drive market movements. Generally, volumes should rise during an uptrend and fall when prices decline if it is true that volumes confirm the price trend. In market situations in which prices rise beyond a previous high, for example, but volumes decline at the same time, we speak of so-called divergences. This kind of market behaviour alerts the chart technician to declining buy pressures. If volumes rise in the case of price falls, the analyst will suspect that the uptrend is in trouble.

One of the best known volume indicators is the OBV :

A positive or negative value will be assigned to the total volume of each day, depending on whether prices closed higher or lower on that day. By adding or subtracting each daily volume, based on the direction of the market closing price, you arrive at a cumulative sum. The direction of the OBV line is decisive here. As already mentioned, it should follow the price trend. Should this not be the case, we can assume there is a divergence or, in other words, a possible trend reversal.

3.1.6 RSI – Relative Strength Index

Following on from Section 3.1.3, the RSI is an extension of the MOM oscillator. The RSI addresses the MOM's lack of standards and the risk of over-valuing exceptions by allowing for a constant bandwidth and greater smoothness. The standard area lies between 0 and 100. The following formula clarifies the calculation of the RSI:

$$RSI = 100 - \frac{100}{1 + RS}$$

$$RS = \frac{\text{average of closing prices on n days with rising prices}}{\text{average of closing prices on n days with falling prices}}$$

In the calculation n usually equals 14 days. In the case of weekly charts 14 weeks are used. The shorter the selected time period (n) the more sensitive the oscillator and the wider its amplitude become.

The RSI is plotted on a vertical scale of 0 to 100. Movements above 70 are considered over-bought, while over-sold market scenarios are reflected in readings below 30. An alternative method of interpretation is to watch the RSI and price developments in parallel. If the price and the RSI rise in tandem and the RSI crosses 50 then this constitutes a buy signal. The same is valid for a parallel fall in the price and the RSI, in which case crossing 50 constitutes a sell signal.

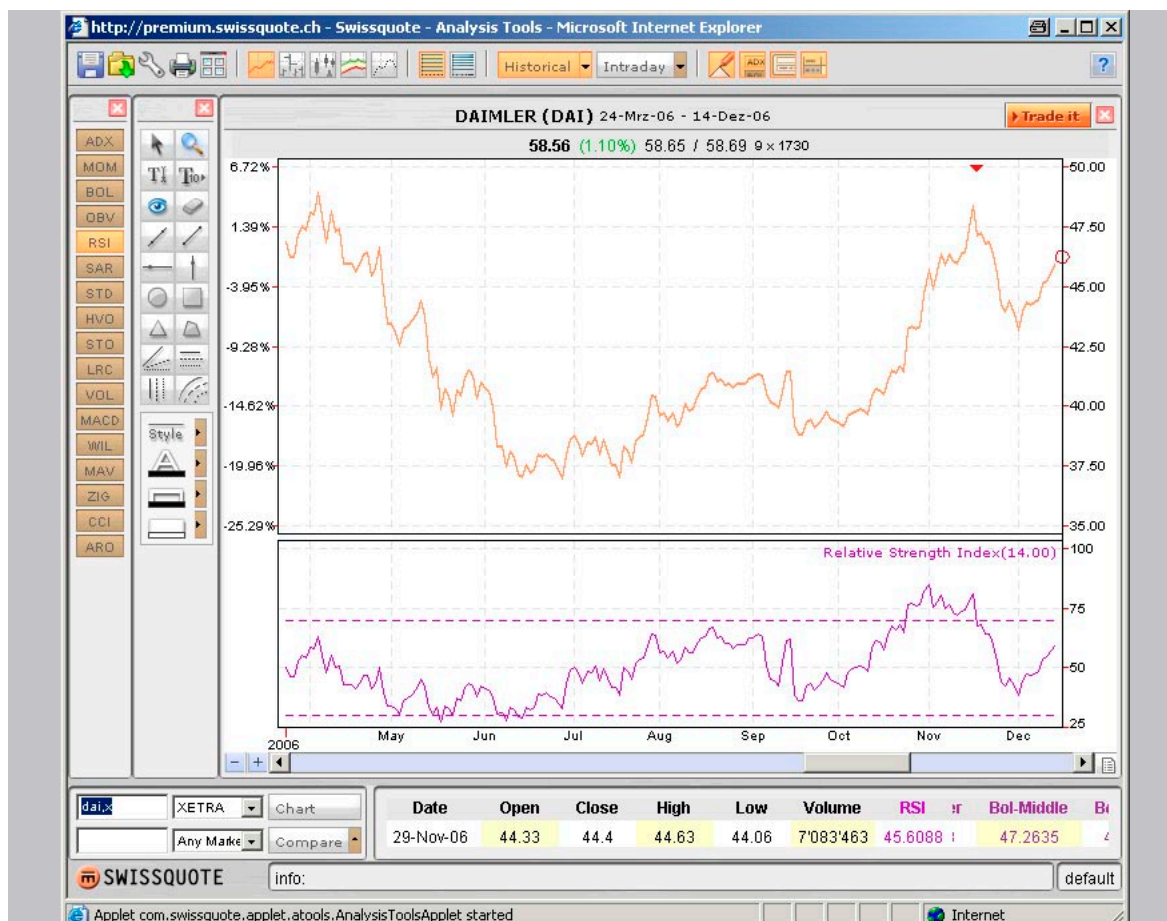


Figure 5: RSI

Another interpretation is based on the search for convergences and divergences between the object of analysis and the indicator. In the case of a bearish divergence, the indicator tops fall while the tops of the object of analysis are still rising. In this situation, for example, it would be advisable to reduce long positions in the portfolio, if not to liquidate them completely. In the case of a bullish divergence, the lows of the analysed object fall while the indicator lows are either at the same level or even rising.

This outline of RSI analysis serves as an introduction, but we recommend, especially for this indicator, reading more on the subject.

3.1.7 Parabolic SAR (Stop and Reverse)

The focus of this indicator is to show a stop level within trend phases that follows the trend as it progresses¹. This provides the investor with continuous exit levels, preventing the loss of already achieved gains. If a long position is stopped out by the Parabolic SAR, the indicator assumes that a short position is taken up (Stop and Reversal).

If the price of the security in question then falls further, the stop level in the shape of the Parabolic (like a parabola) trails behind until the security finally moves in the opposite direction and breaks through the trailing stop level. It's time for another change in position, this time by taking up a long position. This procedure is now constantly repeated. The Parabolic SAR concept assumes that the investor is constantly active in the market and either holds a long or a short position. But this is not mandatory when applying the SAR.

$$SAR_t = SAR_{t-1} + (AF * (EP - SAR_{t-1})),$$

with

SAR_t = current value

SAR_{t-1} = value of the Parabolic SAR in the previous period

EP = extremepoint

AF = accelerationfactor

The above formula should clarify how the new trailing stop levels are created. After checking each time whether a new extreme point has been reached, the acceleration factor is determined. Acceleration only occurs if a new extreme price has been reached within a position, so that we can assume that further movement in the chosen direction and therefore acceleration in the trailing stop level will take place.

¹ These dynamic stop levels are also called trailing stops.



Figure 6: Parabolic SAR

In « Figure 6: SAR », the different changes are clearly visible but also the indicator's weaknesses, especially in the case of sideways movements. While the plotted buy recommendation emerges as the profitable strategy, no clear trading signal is discernible for the period August to November 2005. A combination with either ADX (3.1.2) or ARO (3.1.16) seems advisable.

3.1.8 STD – Standard Deviation and HVO – Historical Volatility

Standard deviation has already been briefly discussed in Section 3.1.4. As mentioned before, it is a measure of the distribution of the values of a random variable around its median value and serves as a volatility measure. The higher the value of the standard deviation, the greater the volatility of the price development. This is also valid for HVO analysis. The basis for the calculation is the same as for standard deviation.

$$\sigma_x = \sqrt{E(n - E(n))^2}$$

Finally, in the case of this formula, the median value $E(n)$ (here the expected value) is subtracted from each of the values being studied (n) and is then squared. The square root of the sum of these values is then taken. The only difference between STD and HVO is that in the case of HVO the prices are logarithmised (natural logarithm), which smoothes out the volatility curve.

3.1.9 STO - Stochastic Oscillator

Another oscillator, the Stochastic Oscillator, assumes that in an uptrend, closing prices tend to move towards the upper end of the bandwidth, while downtrend closing prices tend towards the lower end of the bandwidth.

The indicator consists of two lines on a percentage abscissa. Buy and sell signals again are represented by intersections of lines « %D » and « %K ». A negative break-through of line « %D » by line « %K » denotes a buy signal (in the chart this is shown as a green triangle), whereas a sell signal is generated when an opposite intersection takes place. It is important to note that a sell signal can only be generated above the 80% line, while a buy signal is only possible below the 20% line. In practice, however, this is not necessarily the case as can be seen in « Figure 7: STO », which shows that buy signals can also be generated above the 20% line in the case of a brief correction within a long-term uptrend, and sell signals are possible below the 80% line within a long-term downtrend.

The oscillator can also indicate over-bought and over-sold scenarios by plotting two lines at 20% and 80% that can be moved, at least mentally, depending on the security. Readings below 20% indicate an over-sold scenario, whereas readings above 80% indicate an over-bought scenario.

Furthermore, divergences between the chart's highs and lows and the Stochastic Oscillator should be taken into consideration, in other words, when the historical chart reaches a high that is not confirmed by the oscillator this constitutes a divergence, or a loss of relative strength, which points to a trend reversal.

$$\%K = 100 \frac{(C - L(n))}{(H(n) - L(n))}$$

%D = Average of the last $_{(n)}$ frequencies

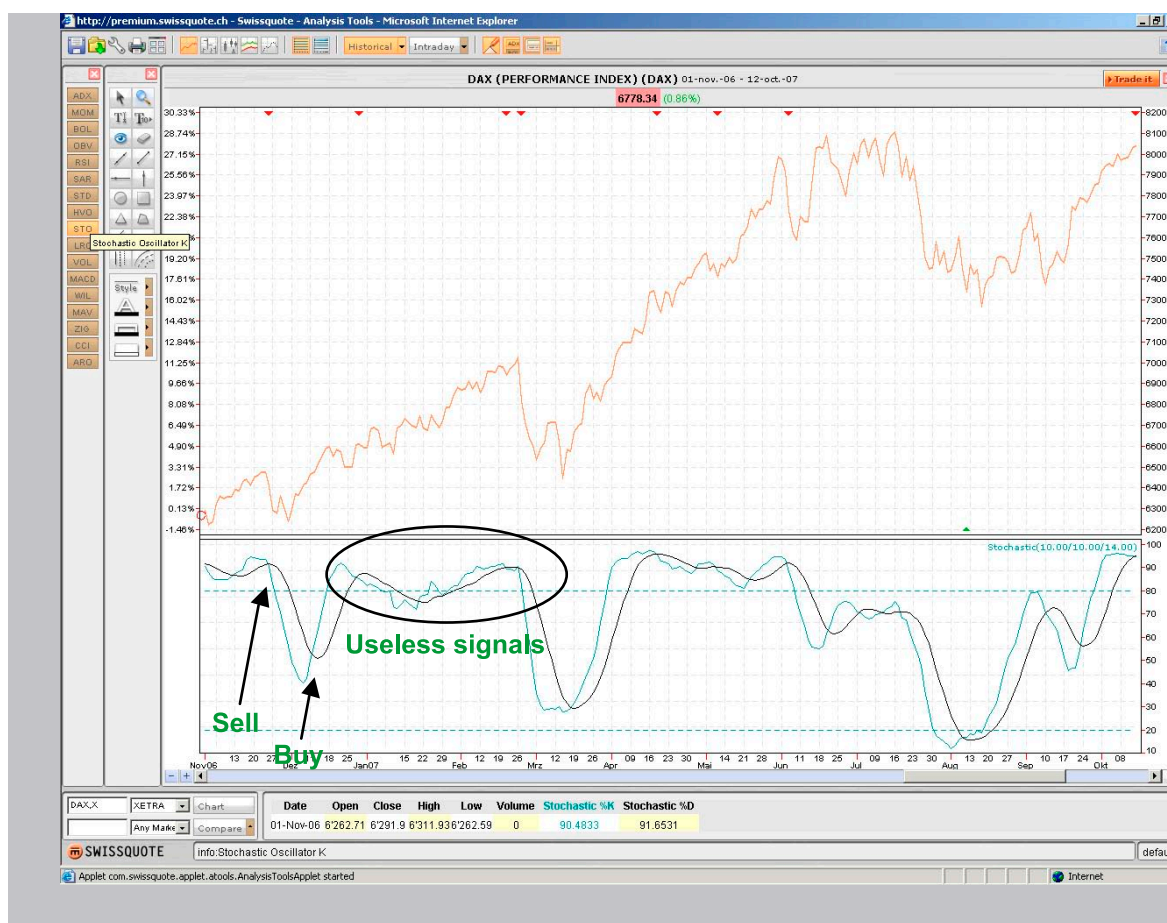


Illustration 7: STO

The graph of the DAX from end-October 2006 to mid-September 2007 illustrates how the oscillator works. Due to the volatility of the index, we have changed the parameters to 14/10/10 to remove unsuitable sell signals.

The first sell signal is generated in the week between 20 and 27 November 2006. One week later, this signal is confirmed by the break through the 80% line.

At the end of the brief correction a buy signal is generated. This signal is clear given the steepness of the intersection's angle. The fact that we are in the middle of a longer-term uptrend is a decisive factor.

In the next period, erroneous sell and buy signals are generated due to a decline in the strength of the trend (the only erroneous signals for that year, which could have been avoided by using the ADX as a complementary indicator to identify sideways tendencies).

In the months April and May, further signals are generated, but they were never confirmed by a break-through of the 80% line. While the DAX rises between mid-March and mid-July 2007, the STO falls during this period.

The first valid sell signal is generated at the beginning of June.

The subsequent intersections must not be taken as buy signals because they are never confirmed, neither upward nor downward, and because a decline in the relative strength of the trend, as shown by the chart and the oscillator, signals a trend reversal.

At the start of August, another clear buy signal is generated, which is confirmed by a break through the 20% line. Personally, we would evaluate this signal in relation to the relative strength of the long-term trend.

3.1.10 LRC – Linear Regression Channel

The Linear Regression Channel is a simple trend-drawing tool. By regressing x number of periods it determines the position of the lines, whereby the sum of the deviations (positive and negative) should be as small as possible. From a purely statistical point of view, the extension of the blue line indicates the next price with the highest probability (based on the last n values) of being correct. The two orange lines on either side of the blue line are drawn equidistant to the blue line, using the largest distance between the price and the blue line as a guideline. The orange lines are used to determine support lines (lower line) and resistance lines (upper line) for a defined period in a very quick and simple process. In the case of manually defining these lines (without LRC), it is important to be clear about your personal investment horizon, which is also a premise for entering parameters for the LRC.

3.1.11 MACD – Moving Average Convergence/Divergence

The MACD indicates the convergence/divergence of the moving average. It is a trend-following oscillator that shows the relationship between two moving average prices. The MACD (also known as fast line) is the difference between two exponential averages. In the default setting, this corresponds to the exponential 26-day moving average and the exponential 12-day moving average (MACD is marked in red). An exponential 9-day moving average, known as signal, trigger or slow line, is plotted on the same axis to illustrate buy and sell opportunities (this line is drawn in black). The main difference between the principle of moving averages and the MACD is the MACD's inclusion of exponential moving averages, a moving average that takes into account all pricing data within the given parameters but gives more weight to the latest data. This principle allows for further interpretation by measuring the distance to a median or 0 line, with extreme divergences – relative to your personal investment horizon – indicating over-bought/over-sold scenarios.

In summary, the following conclusions can be drawn from the interpretation of the MACD:

- A rising MACD denotes an uptrend, a falling MACD a downtrend.
- A buy signal is generated when the MACD crosses its signal line upward. A sell signal emerges when the MACD crosses its signal line downward.
- The distance between the MACD and its median line signals the strength of the trend – the greater the distance, the stronger the trend. A very large distance may be signalling over-bought/over-sold phases that may result in trend changes. At this point, the investment horizon becomes important again. An extreme high **within your personal investment horizon** may signal an over-bought scenario and vice versa.
- When the distance between the signal line and the MACD increases the trend strengthens; when the distance declines the trend weakens.
- Divergences between the MACD and its base (price series for which the MACD was calculated) can be a possible signal for a trend change.

Now let us try to apply the above interpretations to the day chart for ABBN for the current year 2007 (Figure 8: MACD).

On 19 March 2007, the MACD generates its first buy signal at a daily high of CHF 20.8. A few days later this signal is confirmed by other indicators like the MAV (3.1.13), for example, depending on the parameters.

The trend now remains very stable and towards the end, shortly before a recurring negative intersection on 8 May 2007, it even strengthens. The distance between the MACD and the signal line increases, which, in chart technical terms, speaks against a trend reversal and also against a sell signal. During the period 8 May to 17 July, the MACD enters a critical phase in which four sell signals and three buy signals are generated. This shows how important it is to consult a variety of indicators. Even a low-parameter MAV (10/20 periods) has not generated a single trading signal during this period. Nevertheless, we must keep a very close eye on developments during this period because there is a risk that a divergence between the price development and the development of the MACD may arise (the price development is positive whereas the MACD is moving sideways).

The sell signal generated on 18 July is now being confirmed by the moving averages and can be followed. Subsequently, the signals become very clear and a sustained correlation between price development and MACD is established. Furthermore, towards the end of the graph, a local high is recorded during the period that is being studied, possibly another sign indicating the importance of the last sell signal.

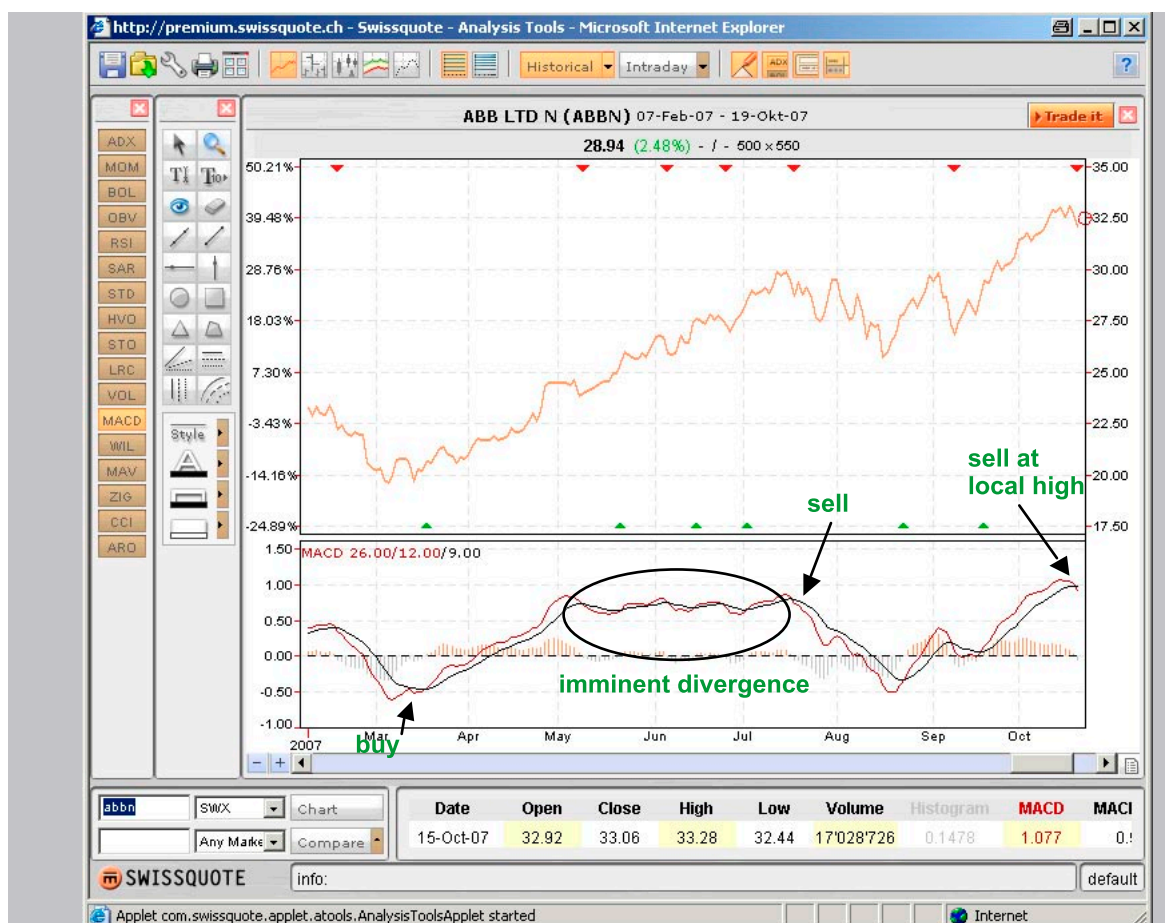


Figure 8: MACD

3.1.12 WIL – Williams %R

The Williams %R (WIL) was developed by Larry Williams and is based on a similar principle as the Stochastic Indicator. It measures the latest closing price in relation to the price bandwidth of a given number of periods and thereby illustrates the strength with which prices move up or down.

As almost every oscillator, the Williams %R also moves in an area between 0 and 100. A reading of 100 indicates that the current price corresponds to the period low; a reading of 0 means the current price corresponds to the highest price in the period being studied. In the Analysis Tool this illustration is turned upside down because the buy signal is generated in the upper section and the sell signal in the lower section. This means a reading of 0 indicates that the current price corresponds to the period high, whereas a reading of -100 indicates a period low.

The extreme areas for the Williams %R are usually recorded between 0 and 20 and between 80 and 100. A buy signal is generated when the indicator moves upward out of the extreme area (over-sold) between -100 and -80. A sell signal is generated when the indicator moves downward out of the area between 0 and -20 (over-bought). Due to its extreme speed, the Williams %R is especially useful for designating entry signals. Williams himself qualifies the use of the indicator by recommending that it is only used in the direction of already existing trends. But this is refuted by the practical example cited below.

The following values are suitable parameters – for short investment horizons five periods, for medium investment horizons the standard setting of 14 periods and for longer investment horizons a setting of 28 periods. In the case of very volatile markets, the extreme areas are often wider in order to generate a signal faster.

The following graph of the CSGN security is an ideal illustration how the indicator can generate a positive performance with a few transactions during a downward pointing trend between April 2007 and end-October 2007.

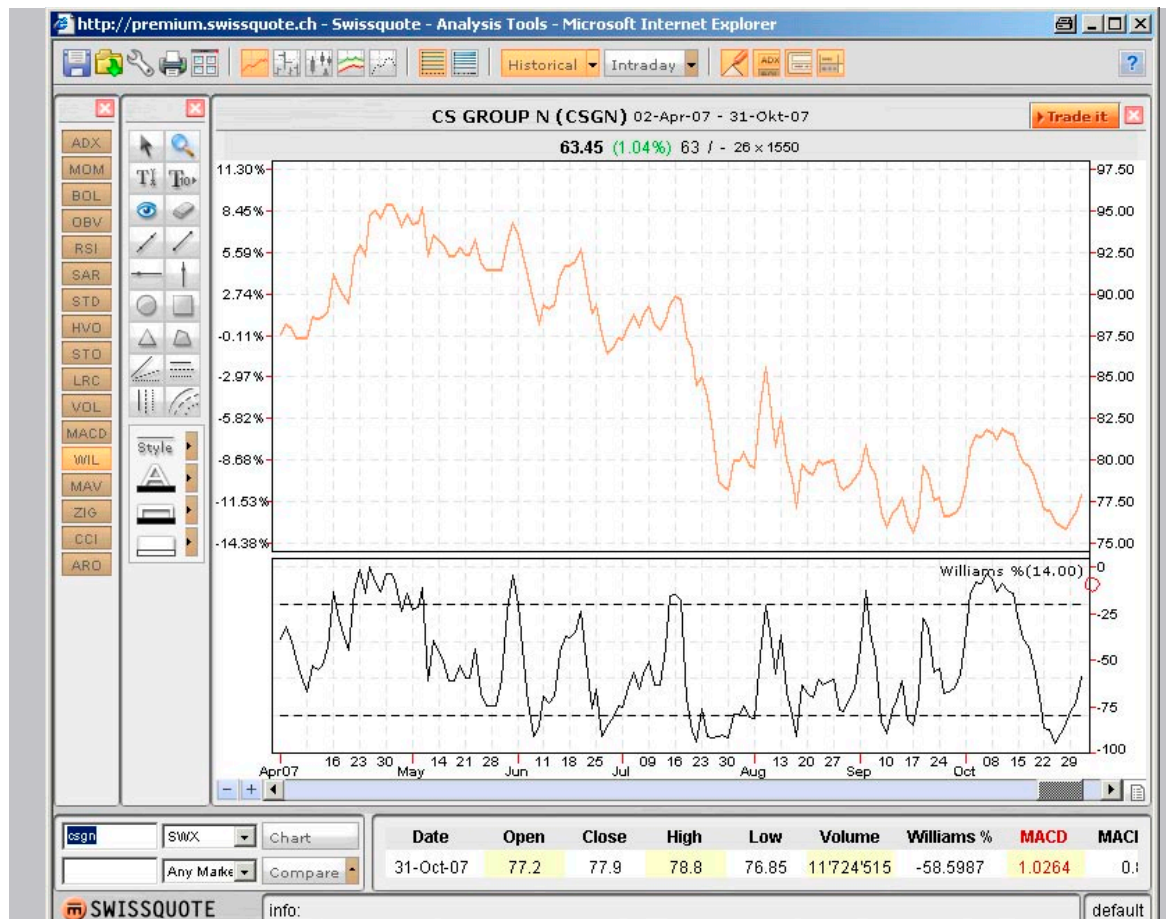


Figure 9: WIL

[> summary](#)

3.1.13 MAV – Moving Average

The Moving Average (MAV) is a very important mathematical indicator and therefore widely used. It is a trend-following indicator. Its purpose is to show the investor that a new trend has started or that an old trend has ended. The Moving Average lags, it does not lead like an oscillator. During analysis, the daily closing prices of the last 20, 50, 100 or 200 days are used, for example. This enables us to filter out the inevitable « noise » of price movements and allows medium- and long-term trends to become visible. In terms of entry and exit signals, moving averages are only useful in conjunction with clear up or downtrends. The art of using moving averages consists of filtering sideways movements in a graph. The ADX indicator described under 3.1.2 is particularly useful for this purpose. Alternatively, you can use the angle of the intersection of two moving averages to determine the strength or importance of a signal. A steep intersection of two lines denotes a clearer trading signal than a flatter intersection.

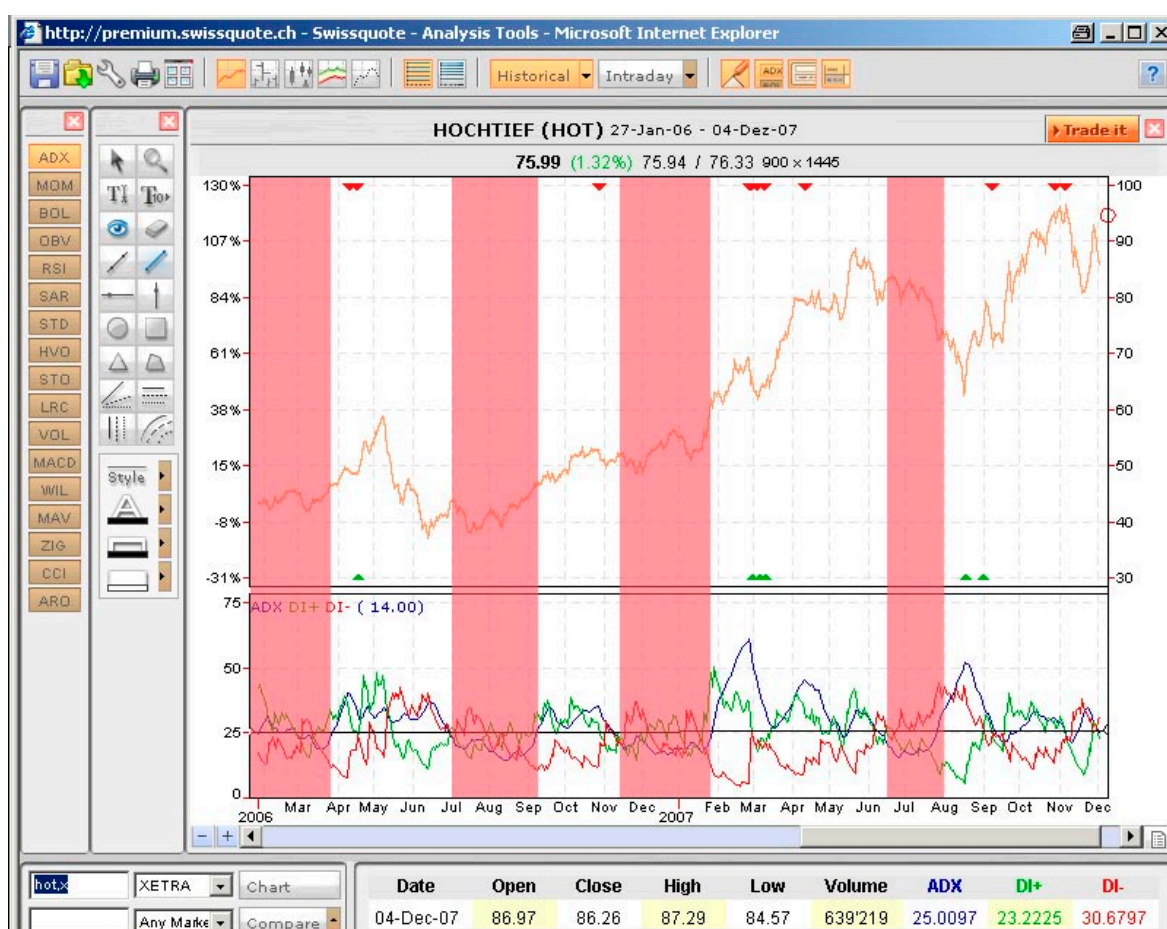


Figure 10: MAV

In the above practical example, we are looking at two indicators (ADX and MAV) in one illustration. In the first phase, the ADX was used to filter out sideways movements from the graph and marked them pink. All ADX readings under 25 are considered sideways trends. Subsequently, we can follow trading signals generated by the second indicator (MAV). We cannot work with the red and green arrows in the upper graph because the ADX also generates trading signals. Therefore, we only look at the MAV's blue and green lines that intersect outside of the red zones or close to the edge of the red zones.

The first buy signal is generated on 23 March 2006 at a daily high of EUR 46.05. We take part in the price rise and sell at a level of 47.27 on 17 Mai 2006. On 29 June 2006 we buy again at 41.51, the then daily high. Then we enter a sideways phase that lasts until September, during which we ignore trading signals. Until today, we are trading the stock according to this principle and we have achieved a very positive performance. In other words, we are almost fully exploiting the bullish trend.

The following point is extremely important in connection with the above method of analysis. If you are in a sideways movement according to the ADX and you have a long or short position when the ADX suddenly indicates a new trend in the opposite direction of the previous up or downtrend, then you must act upon the last trading signal that was generated by the MAV.

3.1.14 ZIG – ZIG ZAG

The ZigZag is not really an indicator because its position and direction can subsequently change. The ZigZag only serves to illustrate and simplify price movements, and therefore it is often used for the Elliot Wave Analysis. The ZigZag's percentage figure determines from which price movement onward a counter-trend « wave » will be drawn. To describe the Elliot Principle would go beyond the remit of this handbook.

3.1.15 CCI – Commodity Channel Index

The Commodity Channel Index, or CCI, was developed by Donald Lambert, a commodities trader in the 1970s and 80s. Lambert wanted the indicator to determine the beginning and end of commodities cycles, but the indicator can be used for analysing any market. In fact, the indicator is very popular nowadays and since the late 1980s it has become an integral part of any trading system.

The CCI calculates a value that measures the distance to the moving average. From a certain distance onward Lambert assumes that a new trend has started – the indicator generates a signal. Unlike many other trend-following and trend-intensity indicators, the zero line is not significant in the case of the CCI. As suggested by Lambert, another two lines are usually drawn at 100 and -100. When the indicator moves between the two lines, Lambert describes this as a trendless market because the distance between the price and the moving average is too small to designate a trend, according to the CCI definition.

A buy signal is generated when the indicator breaks through the 100 line from below. This position has to be sold when the indicator moves below the 100 line again.

A sell signal, in the sense of short-selling, is generated when the indicator breaks through the 100 line from above. This position has to be cancelled again by buying when the 100 line is crossed again from below.

The calculation of the CCI has several steps.

The first step is to calculate a type of median price (TP) on the basis of the daily high, daily low and the closing price.

$$TP_t = (High_t + Low_t + Close_t) / 3$$

Then a moving average (AVG) of the chosen parameter (n) is calculated from the median prices (TP).

$$AVG_t = SUM(n)TP / n$$

In the next step, we calculate the average deviation (sAVG) of the median price (TP) from its average (AVG).

$$sAVG_t = SUM(n)(abs(TP - AVG)) / n$$

In the final step, we calculate the actual CCI based on the results from the previous three steps.

$$CCI_t = (TP_t - AVG_t) / 0.015 * sAVG_t$$

The value for n is usually 20. As with all other indicators, a shorter period (n) leads to faster and possibly erroneous signals. Hence, it is recommended not to change the parameter but only the extreme values.

3.1.16 ARO – Aroon

Translated from Sanskrit, Aroon means « the first light of dawn », and it was developed by Tushar Chande to identify sideways movements. Unlike the ADX, the strength of a trend is not used to find a sideways trend but instead the elapsed time period since the last extreme reading.

In the ARO graph (Figure 11: ARO), two lines are drawn in a separate chart. The ARO up line (green) measures the periods that have elapsed since the last high within the period under study (n), while the ARO down line (red) measures the periods that have elapsed since the last low. Readings on the ARO axis move between 0 and 100. If a 20-day high is reached using the standard parameter of 20 periods (n), the green ARO shows a reading of 100. The more time elapses since the last period high the smaller the ARO up reading becomes. During periods for which the ARO up lies above the ARO down an uptrend prevails and vice versa.

A clear trend exists when both lines move far apart from each other, whereas closer proximity of the lines (they move within readings of 30 and 70) indicate a sideways trend.

A crossing of the lines can indicate a change in trend.

In the practical example of the DAX historical development between March 2007 and October 2007, three trading signals are generated. The first buy signal is generated on 2 April 2007 at a DAX level of around 6950 points.

The subsequent sell signal is generated soon after and actually at an ideal moment. Although the indicator does not include the strength of the trend in its calculations, it is indirectly included because the two lines automatically move closer to each other if no extreme readings occur over a longer period of time, in other words, the trend loses relative strength. Signs of this already emerged on 25 June 2007 (DAX level of 7900 points). Exactly one month later on 25 July 2007, this is confirmed by a crossing of the two lines at a level of 7700 points.

Analysis Tool

User Guide - expert version

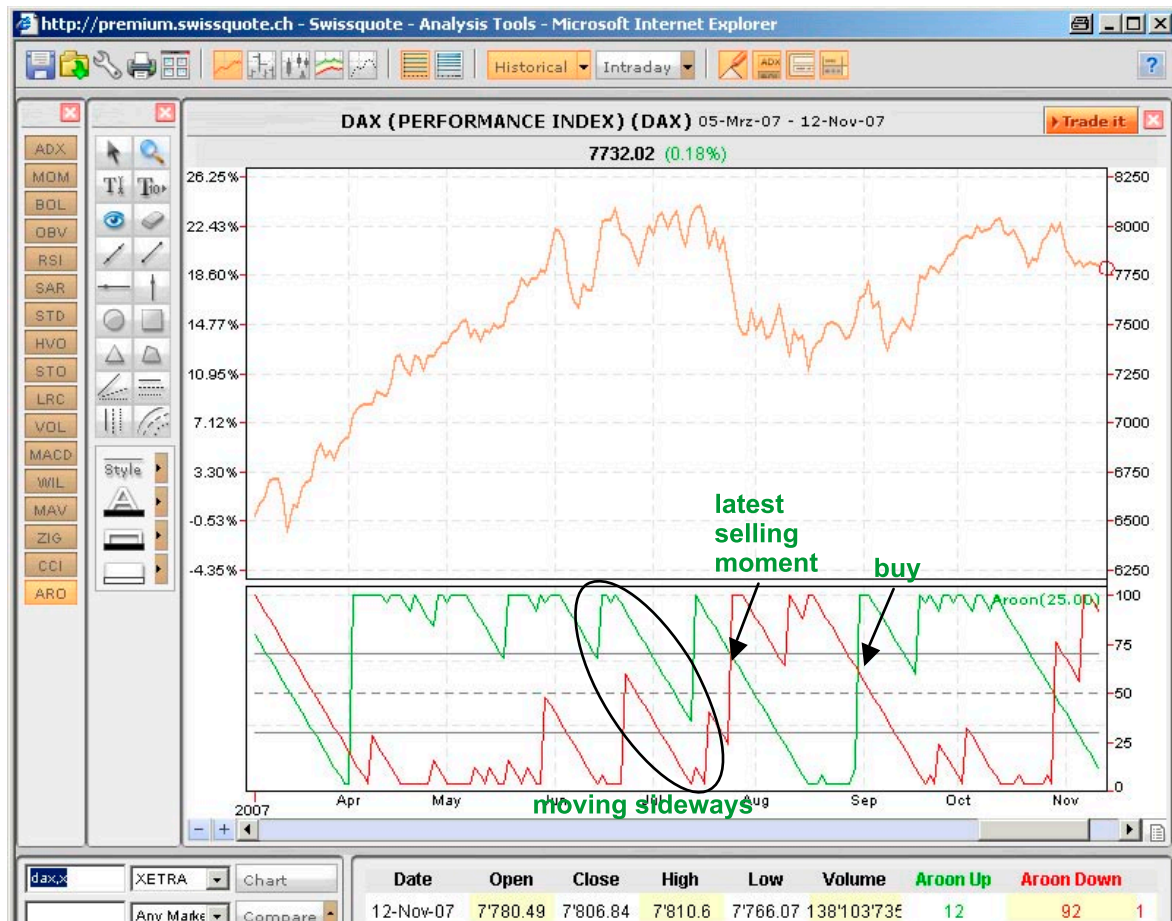


Figure 11: ARO