

Bill Williams Chaos Theory: Overview

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Bill Williams Chaos Theory

Overview

Bill Williams developed his unique theory by combining trading psychology with the Chaos Theory and their effects on the markets. He suggested that rewards from trading and investing are determined by human psychology and that anyone can become a profitable trader/investor if they uncover hidden determinism in seemingly random market events.

Williams says that fundamental or [technical analyses](#) (link to 4.4.2.1) cannot guarantee steady profitable results because they do not see the real market. Moreover, he says that traders lose because they rely on different types of analysis, which are useless in nonlinear dynamic models, i.e. the real markets.

Trading is a psychological game, the way of self-realization and self-knowledge, so the best way to become successful is to find your trading self, to get to know it better and to follow it no matter what. Thus, there are two significant aspects: self-knowledge and understanding of the market structure.

It is Bill Williams' view that making money can be easy if you understand the **market structure**. In order to do this you should be aware of the market's inherent parts called **dimensions**, each of which adds to the total picture.

These market dimensions are:

- [Fractal](#) (phase space)
- [Momentum](#) (phase energy) - Awesome Oscillator
- [Acceleration / Deceleration](#) (phase force)
- [Zone](#) (phase energy / force combination)
- [Balance Line](#) (strange attractors)

It is worth mentioning that before the first dimension ([Fractals](#)) generates a signal, all signals generated by other dimensions should be ignored. Once the position is open in the direction of the first fractal signal, the trader 'adds-on' to this position every time a signal from other dimensions is generated. As a result, a 30% market movement gives the opportunity to make a profit of 90-120%.

Williams' method to [exit the market](#) is very sensitive to price movements, so it helps to fix profit within the last 10% of the trend, capturing not less than 80% of the movement. Bill Williams' theory has become very popular among [Forex](#) (link to 2.1) traders.

Bill William's Chaos Theory

Alligator and Gator

Bill Williams describes the Alligator as being like a compass which keeps your trading in the right direction. The Alligator helps you spot a real trend and stay out of range-bound trading, which always result in losses. The Alligator is the combination of three balance lines:



The Alligator

Alligator's Jaw (the blue line) - 13-period [moving average](#) at the mid price $(High+Low)/2$, which is offset 8 bars into the future;

Alligator's Teeth (the red line) - 8-period [moving average](#) at the mid price $(High+Low)/2$, which is offset 5 bars into the future;

Alligator's Lips (the green line) - 5-period [moving average](#) at the mid price $(High+Low)/2$, which is offset 2 bars into the future.

In order to build the Alligator in MetaTrader 4 use the "**Insert -> Indicators -> Bill Williams – Alligator**" menu sequence.

If all three lines are intertwined, the Alligator is asleep and the market is range-bound. The longer it sleeps, the hungrier it gets. When it wakes up from a long sleep it chases the price much farther, therefore price movements are much stronger. When the Alligator is asleep, stay square. Once the Alligator wakes up, it opens its mouth (Balance lines diverge) and starts hunting. Having eaten enough, it goes to sleep again (Balance Lines converge), so it's time to fix profits.

If the Alligator is not asleep, the market is either uptrending or downtrending:

- if the price is above the Alligator's mouth then it's an uptrend;
- if the price is below the Alligator's mouth then it's a downtrend.

The Alligator also helps to determine the character of the Elliot waves:

- if the price is outside the Alligator's mouth the wave is impulsive;
- if the price is inside the Alligator's mouth the wave is corrective.

The formula for the Alligator:

MIDPOINT PRICE = (HIGH + LOW) / 2

ALLIGATOR'S JAW = SMMA (MIDPOINT PRICE, 13, 8)

ALLIGATOR'S TEETH = SMMA (MIDPOINT PRICE, 8, 5)

ALLIGATOR'S LIPS = SMMA (MIDPOINT PRICE, 5, 3)

Where:

- HIGH - the highest bar price;
- LOW - the lowest bar price;
- SMMA (A, B, C) - smoothed moving average (A - smoothed data, B - smoothing period, C - move into the future),
- ALLIGATOR'S JAW - **blue line**;
- ALLIGATOR'S TEETH - **red line**;
- ALLIGATOR'S LIPS - **green line**.

The Gator Oscillator

The Gator Oscillator shows the degree of convergence / divergence of the Balance Lines:

The Gator

In order to build the Gator Oscillator in MetaTrader 4 follow the "**Insert -> Indicators -> Bill Williams - Gator Oscillator**" menu sequence.

The Gator Oscillator is displayed as two histograms:

- the histogram above zero shows the distance between the blue and the red lines (between the Alligator's **jaw** and **teeth**);
- the histogram below zero shows the distance between the red and the green lines (between the Alligator's **teeth** and **lips**).

All the bars of each histogram are either **green** or **red**:

- histogram bar is red if it is lower than the preceding one;
- histogram bar is green if it is higher than the preceding one.

The Gator Oscillator clearly shows convergence and intertwining of the Balance Lines when the Alligator is asleep or awake thus helps identify a trend.

Bill William's Chaos Theory

Fractals

Bill Williams says that it is better not to take trades before the first fractal is triggered.

A **buy fractal** is a series of five consecutive bars where the highest high is preceded by two lower highs and is followed by two lower highs. The opposite configuration would be a **sell fractal**. Both fractals (Buy and Sell) may share bars.

In order to add fractals in MetaTrader 4 use the "**Insert -> Indicators -> Bill Williams – Fractals**" menu sequence:



Fractals

Fractals generate the following signals:

- if a buy fractal is above the [Alligator's teeth \(the red line\)](#) we would place a [Buy Stop](#) one tick above the high of the up fractal;
- if a sell fractal is below the [Alligator's teeth](#) we would place a [Sell Stop](#) one tick below the low of the fractal sell signal.

- We would not take a buy if a fractal is formed below the Alligator's teeth.
- We would not take a sell if a fractal is formed above the Alligator's teeth.

Fractals are valid until they are either triggered or a new fractal in the same direction appears (in this case the previous signal has to be ignored and the pending order has to be deleted).

Fractals are objects of the **first dimension**. Only after the breakout of the first fractal can the following signals be accepted to open positions in the direction of the first signal. Signals from the consecutive fractals in the direction of the first deal can be used for adding on to the position.

Bill William's Chaos Theory

Awesome Oscillator (AO) Overview

Awesome Oscillator (AO) determines market momentum (the second of five market dimensions) at a given time on the last 5 bars, comparing them to the momentum on the last 34 bars.

Awesome Oscillator (AO) is simply the difference between the 34-period and 5-period simple moving averages of the bar's midpoints $(H+L)/2$. Awesome Oscillator (AO) is displayed on the chart as a histogram:



Awesome Oscillator (AO)

In order to add Awesome Oscillator in [MetaTrader 4](#) use the "Insert -> Indicators -> Bill Williams – Awesome Oscillator" menu sequence.

In MetaTrader 4 each histogram bar which is higher than the preceding one is green, each histogram bar which is lower than the preceding one is **red**.

Awesome Oscillator generates three buy signals and three sell signals, but we do not use them until [the first fractal buy or sell signal](#) is triggered outside the [Alligator's mouth](#).

The Awesome Oscillator Saucer buy signal

Awesome Oscillator Saucer buy signal is generated when the histogram which is above the zero line changes its direction from falling to rising:

The Awesome Oscillator Saucer buy signal

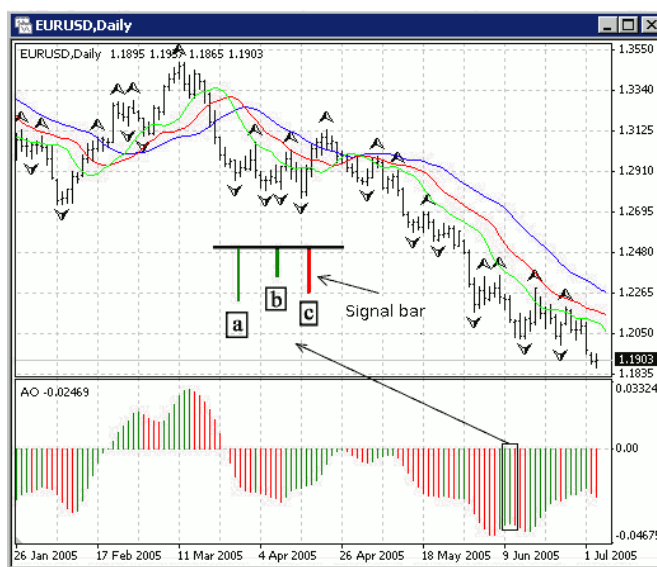
Histogram "A" bar, of any color, should be higher than histogram "B" bar. Histogram "B" bar must be **red**. Histogram "C" bar (signal) must be **green**.

Once the signal has been generated, place a [Buy Stop](#) one tick above the high of the price bar that corresponds to the histogram "C" bar.

The most recent saucer signal cancels all previous ones (do not forget to delete pending orders after the signal is cancelled). Bear in mind that we buy only if the current histogram bar is green and we sell only if the current histogram bar is **red**.

The Awesome Oscillator Saucer sell signal

Awesome Oscillator Saucer sell signal is the opposite of the Awesome Oscillator Saucer buy signal (see above). This signal is generated when the histogram that is below the zero line changes its direction from rising to falling:



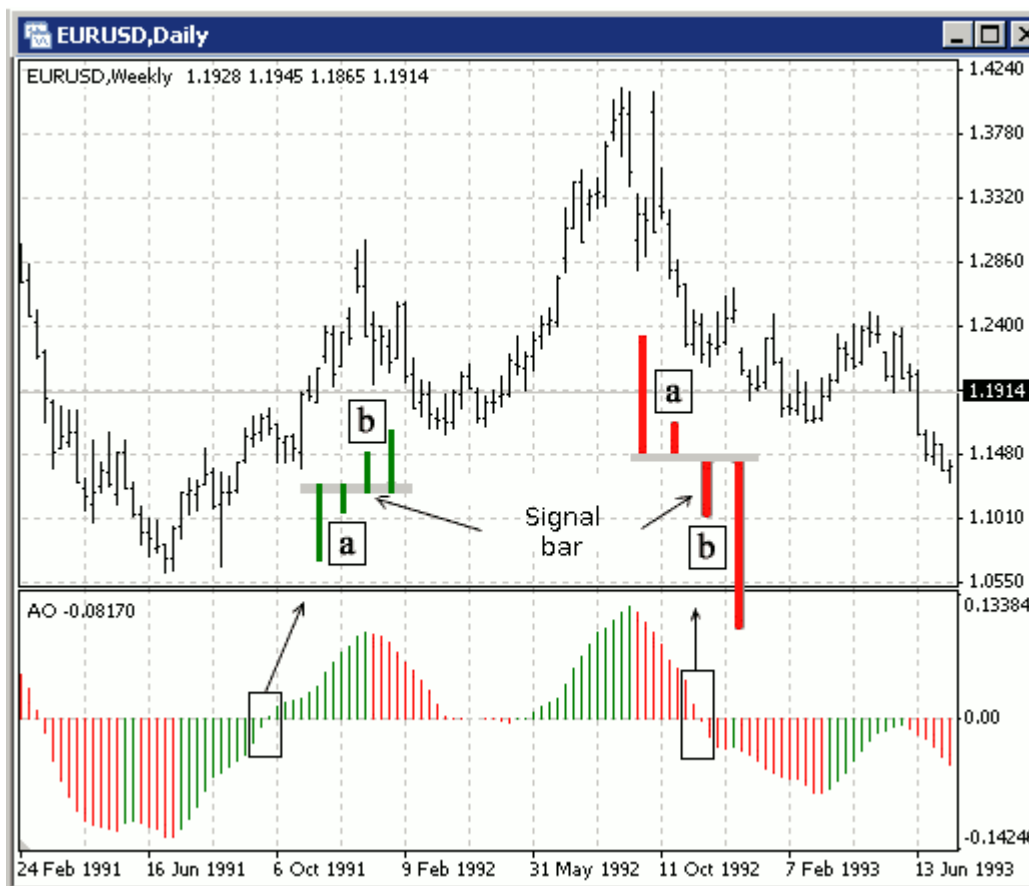
The Awesome Oscillator Saucer sell signal

Histogram “A” bar, of any colour, should be lower than histogram “B” bar. Histogram “B” bar must be **green**. Histogram “C” bar (signal) must be **red**.

Once the signal has been generated, place a [Sell Stop](#) one tick lower than the low of the price bar that corresponds to the histogram “C” bar. The most recent Awesome Oscillator saucer sell signal cancels all previous signals.

Awesome Oscillator cross buy (sell)

A buy (sell) signal is generated when the histogram crosses the zero line from below (above):



The Awesome Oscillator cross buy (sell)

Place a Buy Stop (Sell Stop) one tick above the high of the price bar (below the low of the price bar) that corresponds to the first bar that crosses the zero line. If there is a buy signal, histogram “B” bar (a signal one) is **green**, if there is a sell signal it is **red**.

Twin peaks signals

A buy (sell) signal called the Twin Peaks buy (sell) signal is generated when the histogram is lower (higher) than the zero line, and the last indicator's bottom is higher (last indicator's top is lower) than

the preceding one. Between these two bottoms (tops) the histogram can never be higher (lower) than zero:



The Awesome Oscillator Twin Peaks signal

The Twin Peaks buy signal is the only buy signal that is created below the zero line. Similarly, the Twin Peaks sell signal is the only sell signal that is created above the zero line.

Place a Buy Stop (Sell Stop) one tick higher than the top (lower than the bottom) of the signal bar. In the case of a buy signal, histogram “C” bar (a signal one) is always **green**, otherwise it is **red**.

Never buy on a **red** histogram bar and never sell on a **green** one. If an “unfriendly” histogram bar occurs before the execution of a pending order, which was placed in the direction of the Awesome Oscillator signal, the signal has to be ignored and the order has to be deleted.

Bill William's Chaos Theory

Acceleration / Deceleration Oscillator (AC)

Acceleration / Deceleration Oscillator (AC) measures the acceleration and deceleration of the current momentum (the third market dimension).

Acceleration / Deceleration Oscillator (AC) overview

Bill Williams says that before the price behaviour changes, the momentum changes and, even before the momentum, we see the change in the acceleration.

Acceleration / Deceleration Oscillator (AC) histogram in [MetaTrader 4](#) is the difference between 5/34 momentum histogram ([Awesome Oscillator](#)) and a 5-bar simple [moving average](#) on the Awesome Oscillator:

$$\text{MIDPOINT PRICE} = (\text{HIGH} + \text{LOW}) / 2$$

$$\text{AO} = \text{SMA} (\text{MIDPOINT PRICE}, 5) - \text{SMA} (\text{MIDPOINT PRICE}, 34)$$

$$\text{AC} = \text{AO} - \text{SMA} (\text{AO}, 5)$$

Where:

- HIGH - the highest bar price;
- LOW - the lowest bar price;
- SMA - simple moving average;
- [AO - Awesome Oscillator](#).



The Acceleration / Deceleration Oscillator in MetaTrader 4

In order to add it, use the "Insert -> Indicators -> Bill Williams – Awesome Oscillator" menu sequence.

Unlike the [Awesome Oscillator](#), if the Acceleration / Deceleration Oscillator (AC) crosses the zero line, then it is not a signal. However, we still never buy if a histogram bar is **red** and never sell if it is **green**.

Buy above the zero line / sell below the zero line

A **buy above the zero line signal** is generated when there are two consecutive green histogram bars (a green histogram bar is a bar whose high is higher than the preceding bar's high):

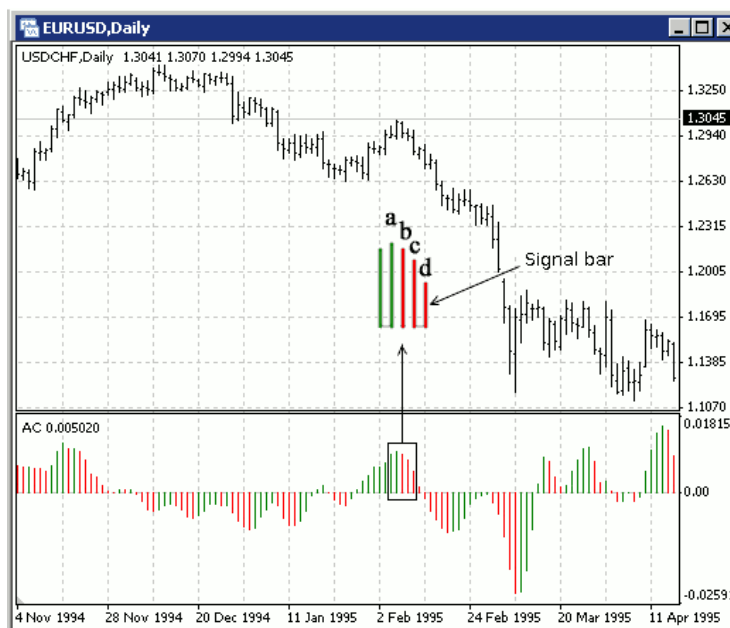
The histogram is above the zero line. Place a Buy Stop one tick above the high of the price bar that corresponds to the second highest high («C»).

A **sell below the zero line signal** is generated when there are two consecutive red histogram bars (a red histogram bar is the bar whose low is lower than the preceding bar's low). The histogram is below the zero line. Place a Sell Stop one tick below the low of the price bar that corresponds to the second lowest low («C»).

Buy below the zero line / sell above the zero line

If the histogram is below the zero line, a buy signal is generated when there are three consecutive **green** histogram bars. Place a Buy Stop one tick above the high of the price bar that corresponds to the third highest high ("D").

If the histogram is above the zero line, a sell signal is generated when there are three consecutive **red** histogram bars:



Place a [Sell Stop](#) one tick below the low of the price bar that corresponds to the third lowest low on the histogram (“D”).

If histogram “B” or “C” bar crosses the zero line, then histogram “C” bar becomes a signal bar, and there is no need to wait for the “D” bar to occur.

- No matter what signal is created you must ignore it until the first fractal buy or sell signal is triggered outside the [Alligator's mouth](#).
- You should ignore signals that are not in the same direction as the first signal from fractal.
- If Acceleration / Deceleration Oscillator generates a signal but the histogram changes its colour before the [pending order](#) is executed, then the signal has to be ignored and the order has to be deleted.

Bill William’s Chaos Theory

Trading in the Zone

When both the momentum ([Awesome Oscillator - AO](#)) and acceleration ([Acceleration / Deceleration Oscillator - AC](#)) have the same direction (both **green** or **red**) this means that the momentum is accelerating in the favorable direction. Such a situation gives an opportunity to create the **Zone** (the fourth dimension):

- If both histogram bars (AC and AO) are green, this is defined as the **Green Zone** (a very bullish market).
- When both are red this is the **Red Zone** (a very bearish market).
- If histogram bars point in opposite directions then it is the **Gray Zone** (market is in transition).

In order to open a new long positions in the **Green Zone** (short positions in the Red Zone) you need to have at least two consecutive green (red) bars, and the close price of the second bar must be higher (lower) than the closing price of the preceding one.

However, we stop adding on to the Zone after five consecutive green or red histogram bars , as it is unusual for the market to have more than 6-8 bars of one colour. After the fifth green (red) histogram bar has occurred, place a [Stop Loss](#) order one tick below the low (above the high) of the fifth bar. If the stop order is not executed on the next bar, then you should change it one tick below the low (above the high) of the sixth bar etc.

Bill William's Chaos Theory

Balance Line Trades

Balance Line Trades Overview

Balance Line trades is the fifth market dimension. The Balance Line is the line where the price would be if there was no new incoming information (Chaos) affecting the market. Mathematical calculations and computerized model analyses helped Bill Williams to find the Balance Line and build a histogram, which can be used to define the distance between the price and the Balance Line. To his surprise, Bill Williams found that this distance can be defined by the [Awesome Oscillator](#) histogram.

Whenever new information comes into the market, it is easier (takes less energy) for the price to move away from the Balance line than to move towards it ("it is easier to go downhill than uphill").



New information on the price chart

The idea of the fifth dimension:

- Buyers are weaker on the "b" bar in comparison to the "a" bar. It proves that the "b" bar's high is lower than the "a" bar's high.
- Why are sellers stronger on the "b" bar? The reason for this is that new information came to the market (on the picture it is shown as a dashed square) and changed the balance.
- If buyers become stronger and raise the market (refer to the "c" bar) to the "a" bar's high, this means that the market balance is changing and it may be a first signal to make a deal within the fifth dimension.

Bar "b" is the base bar:

- **Base bar for a signal to buy** is the most recent bar whose high is lower than the preceding bar's high ("b" bar in the figure above). It may be the current bar; for example, "b" bar when there is no "c" bar yet.
- **Base bar for a signal to sell** is the most recent bar whose low is higher than the preceding bar's low (it may be the current bar).

The first three principles of Balance Line trades:

- 1) Read the chart from right to left.
- 2) If you are waiting for a buy signal, look at the highs only. If you are waiting for a sell signal, look at the bottoms only.
- 3) Establish the base bar first (as described above).

If you have found a base bar for a buy or sell signal then you are halfway to making a deal within the fifth dimension.

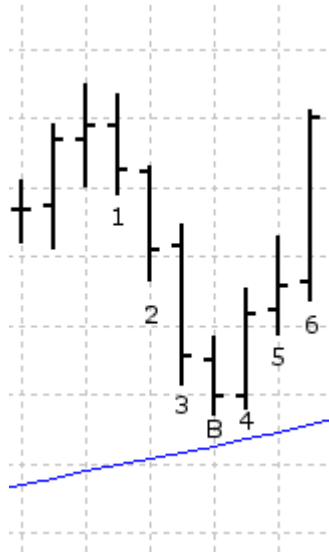
It should be noted that you shouldn't open positions using signals from the 2-5 dimensions before the first signal is generated when the first fractal is triggered. Also, you should only use signals that are in the same direction of the first signal.

Buy Signal above the Balance Line

If the price is above the Balance Line and you wait for a signal to buy, then you expect that the price will move away from the Balance Line (go "downhill").

Principle 4:

- 4) if you move away from the Balance Line then you need one more new high (low) to buy (sell). If instead, you move towards the Balance Line, then you need two new highs (lows).



Buy signal above the Balance Line

Following this principle, for a buy signal you need to wait for the price to rise above the high of the closest preceding bar whose top is higher than that of the base bar:

Let's assume that on the price chart you see bar "1" and all the preceding bars. Hence, you cannot see bars "2", "3", "4" etc yet. At this point, bar "1" can be defined as the base bar for a signal to buy as it is the most recent bar whose high is lower than that of the preceding bar.

The main principle of the **Buy signal above the Balance Line** is that a Buy Stop order has to be placed 1 tick above the high of the bar that precedes the base bar (in our case it is bar "1").

Bar "2" occurs on the chart with the high that is lower than that of bar "1"; so, bar "2" becomes the base bar. The [Pending order](#) has to be deleted and a new Buy Stop must be placed 1 tick above the top of bar "1" (the bar that precedes the base bar "2"). The same happens on bar "3" and bar "B". Once bar "B" has appeared it becomes the base bar, and the pending order has to be placed 1 tick above the high of bar "3".

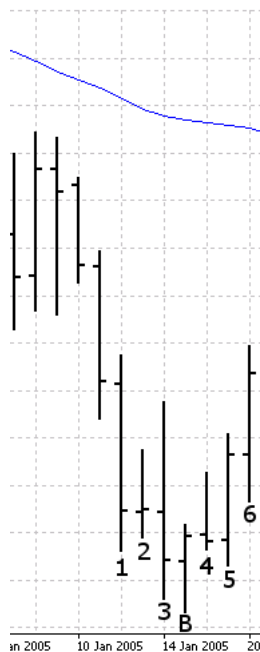
After that bar "4" occurs, but bar "B" is still the base bar, i.e. if you read from right to left, this bar is the first with the high lower than that of the preceding bar. The high of bar "4" is lower than the pending order, so you are not in the market yet. Bar "5" occurs, the base bar remains the same and the pending order is not triggered. But then bar "6" appears and its top is higher than that of the bar which precedes the base bar, so your Buy Stop is triggered and you enter the market following the **Buy signal above the Balance Line**.

Buy Signal below the Balance Line

Obviously, if you buy below the Balance Line you hope that the price will move closer to the Balance Line (go "uphill"). Remember principle 4:

- 4) If you move away from the Balance Line then you need one more new high (low) to buy (sell). If instead, you move towards the Balance Line, then you need two new highs (lows).

This means that you need two highs to get the **Buy signal below the Balance Line**:



Buy signal below the Balance Line

If bar "B" occurs it becomes the base bar, as it is the first bar whose high is lower than that of the preceding bar if you read the chart from right to left. In order to generate a **Buy signal below the Balance Line** you need two highs to the left of bar B. The first of these is bar "3". Bar "2" will not

meet our requirements, as its high is lower than that of bar "3". Bar "1" is the second high you are looking for because its high is above that of bar "3". That is why you must place a Buy Stop 1 tick above the high of bar "1".

When bar "4" occurs nothing changes: the base bar is still bar "B" and the pending order has not been triggered. Bar "5" changes nothing again. When bar "6" occurs the pending order is triggered and the **Buy signal below the Balance Line is generated**.

Sell Signal below the Balance Line

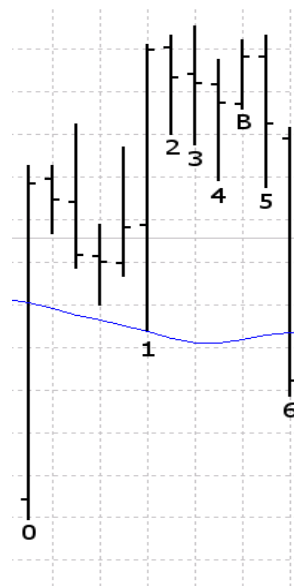
Sell signal below the Balance Line has the same principles as the **Buy signal above the Balance Line**. In both cases you hope that the price will move away from the Balance Line. Following principle 4 (described above) you need to have one low to generate a signal:

Sell signal below the Balance Line

Let's assume that on the price chart you see bar "B" and all the preceding bars. If you read the chart from right to left, then bar "B" is the base bar, i.e. the most recent bar whose bottom is higher than that of the preceding bar. As you only need one lower bottom you can place a Sell Stop order 1 tick below the low of bar "1". Nothing changes when bar "2" occurs: bar "B" is still the base bar and the pending order has not been triggered. Bar "3" also does not change the situation. You should remember that if any of the subsequent bars (before Sell Stop is triggered) becomes the base bar, the previous signal has to be ignored, and the previously placed pending order has to be deleted. In our case, this has not happened yet. When bar "4" occurs, the pending order is triggered and the **Sell signal below the Balance Line** is generated.

Sell Signal above the Balance Line

Sell signal above the Balance Line has the same principles as **Buy signal below the Balance Line**:



Sell signal above the Balance Line

In both cases you hope that the price will move towards the Balance Line (go "uphill"). Following principle 4, you need to have two lows to generate a signal.

Let's assume that on the chart you see bar "2" and all the preceding bars. Bar "2" is considered to be the base bar, i.e. it is the first bar (if you read the chart from right to left) whose bottom is higher than that of the preceding bar. As the price tends to move towards the Balance Line, you need to find two lows to generate a signal:

- First bar right to left, whose bottom is lower than that of the base bar. This is bar "1".
- First bar right to left, whose bottom is lower than that of the bar "1". This is bar "0".

This is why after bar "2" appears, you should place a [Sell Stop](#) order 1 tick below the bottom of bar "0". When bars "3" and "4" occur nothing changes: bar "2" keeps the status of the base bar and the pending order has not been triggered yet.

Once bar "B" appears:

- It becomes the base bar and the pending order, placed 1 tick below bar "0", has to be deleted.
- A new [Sell Stop](#) order has to be placed 1 tick below the bottom of bar "1" (the bottom of bar "4" is lower than the bottom of the base bar "B", and the bottom of bar "1" is lower than the bottom of bar "4").
- The pending order will be triggered on bar "6" and the **Sell signal above the Balance Line** is generated.

No matter what signal is created you must ignore it until the first fractal buy or sell signal is triggered outside the [Alligator's mouth](#). You should ignore signals which are not in the same direction as the first signal generated from fractal.

For all the signals of the fifth dimension there are two principles which will help you recognize false signals:

- Never sell above or buy below [Alligator's mouth](#).
- If the current bar is in the Red or Green Zone (refer to the "[Trading in the Zone](#)" page), double the number of new higher tops (lower bottoms) that are required to create a buy (sell) signal.

Bill William's Chaos Theory

Exit the Market

How to place Stop Loss orders

Bill Williams gives his recommendations in relation to [Stop Loss](#) orders

- If on the opening the market is trending, then it is better to close positions if the bar's closing price crosses the [Alligator's teeth](#) (the red line).
- If the market is volatile, use the [Alligator's Lips](#) (the green line) as the level to place a Stop Loss order. The market is characterized as volatile when the prices angle of inclination is

more than that of the green line. In both the above cases, at the end of the current bar the Stop Loss is shifted to the level of the red or green line of the next bar.

- Once the fifth histogram bar occurs in the **Green Zone** (**Red Zone**) place the Stop Loss (refer to the ["Trading in the Zone"](#) page).
- Close all open positions if a signal in the opposite direction appears. Bullish divergence / bearish convergence between the [Awesome Oscillator](#) and the price signals that the trend is about to end:



Divergence between the price and the Awesome Oscillator is the signal that the current trend is weak

Bill William's Chaos Theory

Market Facilitation Index (BW MFI)

Market Facilitation Index (BW MFI) analyses the amount the price changes for each unit of volume.

Market Facilitation Index (BW MFI) is calculated as follows:

$$\text{MFI} = (\text{HIGH} - \text{LOW}) / \text{VOLUME}$$

Where:

- HIGH - the highest price of the current bar;
- LOW - the lowest price of the current bar;
- VOLUME - volume of the current bar.

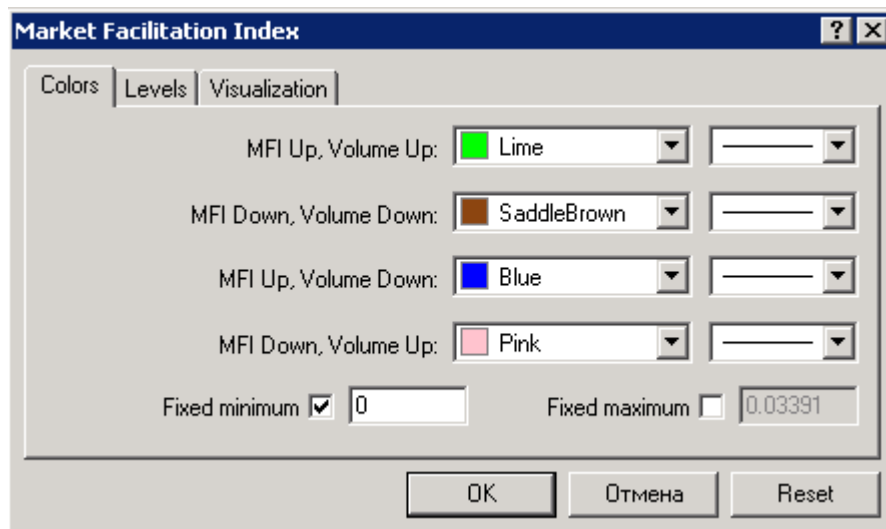
Market Facilitation Index (BW MFI)

In order to add it, use the "Insert -> Indicators -> Bill Williams -> Market Facilitation Index" menu sequence.

Market Facilitation Index (BW MFI) signals:

- **When both BW MFI and Volume rise** at the same time, it means that the market is moving primarily in one direction and that more people are participating in the market. It is a good time to already be in the market.
- **When both BW MFI and Volume decrease** at the same time, it means that traders' interest starts to fade. Often it occurs toward the end of the trend.
- **When BW MFI is pointing higher and Volume is pointing lower**, it means that the market primarily moves in one direction but there are no new participants to generate higher volume. Price movements are the result of speculation.
- **When both BW MFI goes down and Volume goes up**, it means that there is a battle between bulls and bears (large volume) and their forces are almost equal (the price does not change significantly). This typically occurs prior to a significant move in the opposite direction. Close attention should be paid to the direction that the price moves when breaking out of this slowdown. Bill Williams called this a **squat bar**.

In MetaTrader 4 all these Market Facilitation Index changes can be of different colors:



Market Facilitation Index settings in MetaTrader 4