

## ML5 EA DEVELOPMENT PROJECT

Project Details	
Client:	Cornelius
Project Title:	Beta: Bollinger Band Tester
Developer:	
Project Start Date:	2022.12.xx
Project End Date:	2022.12.xx
Agreed Upon Budget:	xx USD
Language	MT5
Compatible Pairs / Indices	All – the EA should be useable on any chart and pair.
Deliverables	<ul style="list-style-type: none"><li>• Functioning EA in MT5</li><li>• Uncompiled code (must compile without errors).</li><li>• Compiled EA must be able to be uploaded to the ML5 marketplace – an indication of robust and clean coding.</li><li>• Must include a BBW% indicator with the possibility of showing the highest and lowest values over a selected lookback period.</li></ul>
Reference Documents	None

I would like to create an EA which trades volatility breakouts, using Bollinger Bands and the Bollinger Bandwidth in order to generate signals.

Based on when a “squeeze” is detected, pending orders will be placed some distance away from price in both the BUY and SELL directions. The EA will ensure that the squeeze condition has been valid for some minimum amount of time as defined by the user. Once pending orders are opened, they are updated each bar, so long as the squeeze is still valid. When one side’s position is opened, the other side’s pending position is cancelled.

In the standard operating mode, the EA uses a hard SL, a breakeven, and two other close methods. One based on price crossing (and closing past) the middle moving average of the BB. The second a stepped TS.

### BB Moving Average:

- If the opened position was a BUY, the position closes when price closes below the moving average
- If the opened position was a SELL, the position closes when price closes above the moving average

### Stepped Trailing Stop:

The EA sets the distance between the position open and the Breakeven using one of two variables: “BE Level Points” or “BBWp Multiple”. Essentially each time a multiple of this distance is reached, the SL is moved forward one level. For example when the BE on a BUY is hit, the SL is moved to the open price. If price rises and hits this multiple again, the SL is moved ahead one more level.

### Head-fake Management:

For testing purposes there will be a “head fake management” mode, in which the EA will attempt to recover a losing position. The head-fake occurs when price breaks out of a squeeze in one direction, resulting in the opening of a position, only to quickly turn back and move in the opposite direction. This function does not use any dangerous grid or recovery system.

### **Bollinger Bandwidth**

The Bandwidth indicates the relative distance between the top and bottom band limits. This is a measure of volatility. When the calculated value is below 10% (for example, default) it means that we are in a period of very low volatility and that a higher volatility period will soon follow.

Formula:

- $BBW\% = (TBB - BBB) / SMAC$

Where:

- $BBW\%$  = Bollinger Bandwidth
- $TBB$  = Top Bollinger Band
- $BBB$  = Bottom Bollinger Band
- $SMAC$  = Simple moving average close (the same period as the Bollinger Bands used by the upper and lower bands).

Notes:

- 1) The EA will use the BB indicator already included in the meta trader terminal.
- 2) The bandwidth is calculated per bar, as any other indicator. If selected by the user, the indicator shall be visible on the chart, in the indicator window.
- 3) The Bollinger Band settings will be accessible in the EA inputs.

Additionally:

- $BBWp = (TBB - BBB)$

Which is a value in points used to determine where pending BUYs and SELLs should be placed.

A full definition and explanation for  $BBW\%$  can be found here:

<https://www.investopedia.com/articles/technical/04/030304.asp>

### **The Bollinger Squeeze**

The Bollinger Squeeze is identified once the  $BBW\%$  falls below some predefined value, such as 10%.

### Position Entry Overview

The user has defined some values for the Bollinger Bands, and the BBW% is calculated using these same parameters (see above). The user has equally defined some value for the BBW% under which we will consider that a squeeze period has been obtained.

- Squeeze Flag (SF) = the level of BBW% to determine a squeeze = 10% default
- Min Squeeze Duration (MSD) = the minimum number of bars that the Squeeze flag must be valid before allowing a pending order to be placed.
- BUY Multiple = a multiplier to determine where to set a BUY pending order = 0.5 default
- SELL Multiple = a multiplier to determine where to set a SELL pending order = 0.5 default

### Setting and Managing Pending Orders

Upon open of a new bar (bar n), the EA checks the preceding value of BBW%.

- If  $BBW\% (n-1) \leq SF$  AND BBW% has been  $\leq SF$  for a number of bars  $\geq MSD$ , THEN
  - A pending BUY order is placed a distance = (BUY Multiple) x BBWp, above the high of the n-1 candle. A SL is set at the level of the pending SELL order.
  - A pending SELL order is placed a distance = (SELL Multiple) x BBWp, below the low of the n-1 candle. A SL is set at the level of the pending BUY order.
- ELSE, do nothing

The RISK value is then calculated as the distance between the pending open and its SL values.

The purpose of the above is first to make sure that the squeeze condition has been valid for some minimum period of time, and then to keep updating the pending open levels on each new bar that price is within the squeeze level. Once the BBW% exits the squeeze zone (rises above SF), the pending orders are frozen in place until triggered or deleted.

### Opening Pending Orders

Price moves in the BUY direction:

- If the BUY pending order is triggered, it will be managed as outlined in the position management section,
- The SELL pending order is cancelled.
  - *Unless the head-fake management option is active, at which point the SELL pending order is managed as outlined below.*

Price moves in the SELL direction:

- If the SELL pending order is triggered, it will be managed as outlined in the position management section,
- The BUY pending order is cancelled.
  - *Unless the head-fake management option is active, at which point the BUY pending order is managed as outlined below.*

## **Position Management Overview**

There are two methods of position management, one which uses hard SL values, and the second which is a special head fake management approach.

### **Standard Positive Position Management**

When a position moves in the right direction after opening, we use the Breakeven (BE) method. Conceptually this means that when price reaches the user defined BE point:

- Some % of the position is closed, and some % stays open.
  - For a BUY the SL of the remaining position is moved to the open price + BEV
  - For a SELL the SL of the remaining position is moved to the open price - BEV
- The remainder of the order stays open until price hits the SL value, or closes beyond the middle moving average of the BB, meaning:
  - If the opened position was a BUY, the position closes when price closes below the MA.
  - If the opened position was a SELL, the position closes when price closes above the MA.

Where BEV = the Break Even Value, a value defined in points by the user.

### **Break Even Level Definition**

The breakeven level will be defined using values defined by the user either in points or as a multiple of the BBWp. Defaults:

- BE Level Points = 50
- BBWp Multiple = 2.0

Once a position is opened, the level of the breakeven is defined as:

- For a BUY (depending on the user selected method BE Level Points / BBWp Multiple):
  - BE price = Open price + BE Level Points
  - BE price = Open price + (BBWp x BBWp Multiple)
- For a SELL (depending on the user selected method BE Level Points / BBWp Multiple):
  - BE price = Open price – BE Level Points
  - BE price = Open price – (BBWp x BBWp Multiple)

### **Stepped Trailing Stop**

The EA sets the distance between the position open and the Breakeven using one of two variables: BE Level Points or BBWp Multiple. Essentially each time a multiple of this distance is reached, the SL is moved forward one level.

Example:

A pending BUY position is set 1.15100, and the SL is 1.15000. The RISK is therefore defined as the difference, 100 points. The BE point is set to 1.15200.

When price hits 1.15100 the position opens. When it hits 1.15200, 50% closes and the SL is moved to 1.15100+BEV. Price continues to rise and reaches 1.15300, the SL is moved to 1.15200. Price continues to rise and hits 1.15400, the SL is moved to 1.15300, etc.

For each multiple of the RISK that is achieved, the SL is moved one level forward.

## **Losing Position Management**

### **Default Management System**

In the default management system, positions are closed:

1. Once the SL is hit.
2. Once price closes beyond the middle MA of the Bollinger Band.

### **Head-fake Management System**

Oftentimes what happens with the Bollinger Bands is that we witness what is known as a “head fake”. This means that we take a position in one direction, only to have the market reverse and ultimately go the other way. The head-fake Management function tries to deal with this by closing the first erroneous position and replacing it with a position in the right direction. It is proposed to manage as follows:

1. If the initial pending order is triggered, and that position reaches its BE point:
  - a. It is managed as above and the 2<sup>nd</sup> pending order is deleted.
2. If the second pending order is triggered before hitting the BE of the first:
  - a. The first position is closed at a loss.
  - b. The second position is opened with a multiple on the lot size (HFLM)
  - c. This second position’s SL is the opening level of the first position.
3. This new position is also managed according to SL and BE rules as set out previously.

The multiple of lot size for this second position = HFLM, Head Fake Lot Multiple. It defaults to 1.0.

Recall that if head fake management is FALSE, once a first pending order is triggered the second is deleted per the standard management rules. If head fake management is TRUE, the second pending order is not immediately deleted and is instead managed as above.

## **Variable List**

The following variable list should be available in this EA.

- Global Variables
  - Max spread 20
  - Magic number 15151
- Money Management
  - Money management TRUE / FALSE (default TRUE; FALSE means fixed lots)
  - Lots / 10k Balance 0.1 (also used for fixed value)
- Position Management
  - Breakeven Lot Close 50%
  - Break Even Value BEV 10 points
  - BE Level Points / Mult? Points / Multiple
  - BE Level Points 50
  - BBWp Multiple 2.0
  - Stepped Trailing Stop TRUE / FALSE
- Bollinger Band Parameters
  - Bollinger Period 20
  - Bollinger std 2
- Bollinger Squeeze Parameters
  - Squeeze Flag 10%
  - Min Squeeze Duration 3 (candles)
  - BUY Multiple 0.5 default
  - SELL Multiple 0.5 default
- Bollinger Bandwidth Indicator
  - Lookback period 20
  - Visible under main chart TRUE / FALSE
- Head Fake Management
  - Head-fake Management TRUE/FALSE
  - HFLM 1.0
- Trade Open Times
  - Monday TRUE
  - Tuesday TRUE
  - Wednesday TRUE
  - Thursday TRUE
  - Friday TRUE
  - Start Time 00:00
  - End Time 21:00

**Deliverables**

Conclusion of the project will be measured according to the following:

- Functioning EA in MT5
- Must be backtest-able in MT5 without error.
- Uncompiled code (must compile without errors).
- Compiled EA must successfully upload to the MQL5 marketplace – an indication of robust and clean coding.
- The EA must include a BBW% indicator with the possibility of showing the highest and lowest values over a selected lookback period.