

TRIANGLE HEDGING ROBOT FOR EURGBP, EURJPY AND GBPJPY PAIRS ON THE MT4 PLATFORM

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ABSTRACT

The Triangle Hedging Robot or Expert Advisor is designed for the MetaTrader 4 (MT 4) platform. The robot can monitor signals, open positions, close positions both for each currency pair and as a whole. The robot is also designed to be able to run automatically or semi-automatically. The robot is implemented in the foreign exchange (forex) market for the EURJPY, GBPJPY and EURGBP pairs. Position opening is based on technical analysis using the Moving Average (MA) method. A Buy position will be opened if there is an upward cross from the small period MA to the big period, and conversely a Sell position will be opened if there is a downward cross from the small period MA to the big period. The robot works based on two cycles that have been defined, namely the first cycle in the form of buying EURJPY, selling GBPJPY and selling EURGBP; and the second cycle is selling EURJPY, buying GBPJPY and buying EURGBP. Each cycle is a complete position of Triangle Hedging. Robots can also work with user interaction. If the user opens a position with a certain lot size, the robot will perform lot calculations and determine cycles to hedge properly. The results of testing the robot show that the robot works well according to its purpose. It's just that the robot still needs to be tested more intensively to determine whether the robot can provide benefits for the user in the medium or long term.

Keywords: expert advisor, forex, meta trader 4, robot, triangle hedging.

1. INTRODUCTION

The forex exchange market (forex) or foreign exchange (forex) is a currency trading market between countries. This market involves the world's major financial markets and lasts 24 hours from Monday morning to early Saturday morning. The forex market begins with the opening of the New Zealand and Australian markets, then continues to markets in Japan, Singapore and Hong Kong. After the Asian markets closed, they continued on to the European markets, namely Germany and England; and lastly is the United States market. [1] The forex market has liquidity and the rapid price movement means that the return on investment can exceed the average trading rate, but it also carries a very high level of risk. [2] Therefore, it is not recommended to carry out forex transactions without knowledge of these risks. [3]

Derivative transactions in the form of forex are also increasingly popular along with the development of mobile technology. One of the well-known platforms is MetaTrader. This platform allows retail traders to make forex transactions easily. [4] In MetaTrader it is possible to develop robots called Expert Advisors (EAs). EA can be programmed to make decisions to make buy or sell transactions and even liquidate transaction positions, either in part or in whole.

Good EA development requires knowledge of technical analysis, fundamental analysis and money management, as well as the MetaQuote Language (MQL) programming language.

Based on the background of the problems above, the identification of problems in this study are as follows:

- 1) With a very high level of liquidity and price movement speed (ultra high frequency), the right tools are needed to help traders.
- 2) With the development of platform technology such as MetaTrader it is possible to develop tools in the form of robots or EA. This EA will be able to help traders to take trading positions and also maintain capital risk on transactions that occur.

Based on the identification of the problems above, the formulation of the problem in this study, namely: designing a robot or EA that is able to take transaction positions automatically and perform risk management on transactions both carried out automatically by robots or EA or by traders manually. The design of this robot or EA is specifically for the MetaTrader platform, namely MT4 which is one of the most popular platforms. Robots or EA are designed to be able to carry out automatic transactions without trader intervention. In addition, robots or EA will be able to hedge against transactions made manually by traders. This robot or EA design has specifications in the form of:

- 1) Using the MetaTrader 4 platform,
- 2) Automatic and semi-automatic transactions,
- 3) Able to take profit or take profit,
- 4) Able to close all open transactions.

2. RESEACH METHOD

This study aims to design a robot or EA that will help open trading positions and carry out profit taking actions automatically. The place where the research was carried out was at the Computer Laboratory of the Electrical Engineering Study Program, Tarumanagara University. The research time was carried out for one semester. This research is in the form of application design on MT4.

- 1) User Experiences (UX) Design: This design is to find out how the user or users will use the application,
- 2) Algorithm Design: Algorithm design to open automatic transactions and perform profit taking actions automatically,
- 3) UX and Algorithm Testing: This test is to find out whether the design application is functioning properly or not.

3. RESULTS AND DISCUSSIONS

3.1. Results

3.1.1. Forex Market

There are three types of forex or foreign exchange transactions that are carried out in international trade, namely: [5]

- 1) Cash Transactions (Spot Transactions)
 - Value Today,
 - Values Tomorrow,
 - Spot values.

- 2) Past Transactions (Forward Transactions)
- 3) Barter Transactions (Swap Transactions)

Forex or forex transactions are carried out with various motives. This transaction is carried out both by banking financial institutions and non-banking financial institutions, besides that it is also carried out individually. The motives for this transaction can be grouped into:

- For both individual and institutional payments,
- Maintain purchasing power by the country's central bank for national needs,
- Remittances between countries, and
- Make a profit.

Forex or forex transactions are two-way, where traders can make buying or selling transactions. In this transaction, transaction units are expressed in lots and pips. The value of 1 lot is \$ 100,000 and 1 pip is \$ 10. [6]

3.1.2. MetaTrader 4

MetaTrader 4 or MT4 is developed by MetaQuotes Software company. This software was released in 2005. MT4 is available to traders through brokers licensed by MetaQuotes Software. MT4 consists of two parts, namely the client and server parts. The server part is installed by the broker, while the client part is used by traders. With this MT4 software, traders get live prices as well as charts. Traders can make transactions through the MT4 terminal. [7] The MT4 terminal on the trader's side consists of various types, including applications based on MS Windows, MacOS, iOS, Android, and so on. Traders can run programs on this terminal to get convenience in transactions such as using indicators or robots/EAs. Apart from MT4, MetaQuotes Software also released MT5 in 2010. In 2022, MetaQuotes Software has terminated the broker license for MT4.

3.1.3. MQL

MQL4 is a programming language that is used to program both indicators, strategies and robots or EAs on the MT4 platform. [8] MT4 provides an IDE in the form of the MetaQuotes Language Editor for programming. Apart from that, you can of course use a normal editor program, it just doesn't have the Editor-like support provided by MT4. [9]

3.1.4. Transaction Pattern

The transaction pattern made by the robot is triangle hedging. The currency pairs used are EURJPY, GBPJPY and EURGBP. Table 1 shows this pattern. Buy EURJPY means buy EUR and sell JPY, sell EURJPY means vice versa. Likewise with other currency pairs, following this understanding. In this design, the robot works based on cycles. This work cycle is divided into two cycles (see Table 1). Every cycle that occurs indicates a hedging condition. After one cycle is complete, the robot will monitor to start a new cycle. In hedging conditions, the Profit/Loss (P/L) condition does not move until a new cycle starts.

Table 1. Triangle Hedging Patterns

SIKLUS	EURJPY	GBPJPY	EURGBP
1	BUY	SELL	SELL
2	SELL	BUY	BUY

Figure 1 shows the robot opening a buy position (marked with a blue arrow) and a sell position (marked with a red arrow) for the EURJPY pair. Figure 2 shows the robot position opening for the GBPJPY pair. Figure 3 shows the robot position opening for the EURGBP pair. Figure 4 shows the cycle that the robot opened in order to do triangle hedging. Figure 4 shows that the robot has completed two cycles by starting the third cycle by opening a new position. In the first cycle, it can be seen that the robot opens with a position of 0.02 lots, this is a continuation of the previous cycle. In the second cycle, the robot opens with a position of 0.01 lots, this is the default lot that is set when the robot opens automatically. If there is a TP action on one of the pairs, the robot calculates the remaining lots and performs hedging. This is what causes the value of 0.02 lots to appear. If the open position is unable to generate the expected profit of 2 USD, the robot will continue to open positions according to the design algorithm, and perform TP actions for each pair.

3.1.5. Profit and Loss Pattern

The robot is designed to be able to take profit (TP) with a total value of 2 USD, both for each pair and as a whole. If the TP is performed on a certain pair and not the whole, then the robot will re-do the hedging action by calculating the remaining lots. The robot prioritizes the completion of each cycle. If the TP is done in its entirety, the robot closes all open pair positions and there will be no remaining positions. Next, the robot starts with a new cycle. Figure 2 shows the red and blue dotted lines, this shows the robot performing TP action on the GBPJPY pair.

3.1.6. User Interface (UI) Design

The User Interface (UI) design is kept to a minimum so it's easy to use. The robot can be installed on any time frame in Meta Trader 4. Figure 5 shows the UI of the robot. In this UI, it can be seen that the user only needs to fill in two column values to be able to directly implement the robot on his trading chart. With a simple UI, users can intuitively use the robot without the need for further learning.



Figure 1. Buy and Sell Robot Openings in the EURJPY Pair



Figure 2. Buy and Sell Robot Openings in the GBPJPY Pair

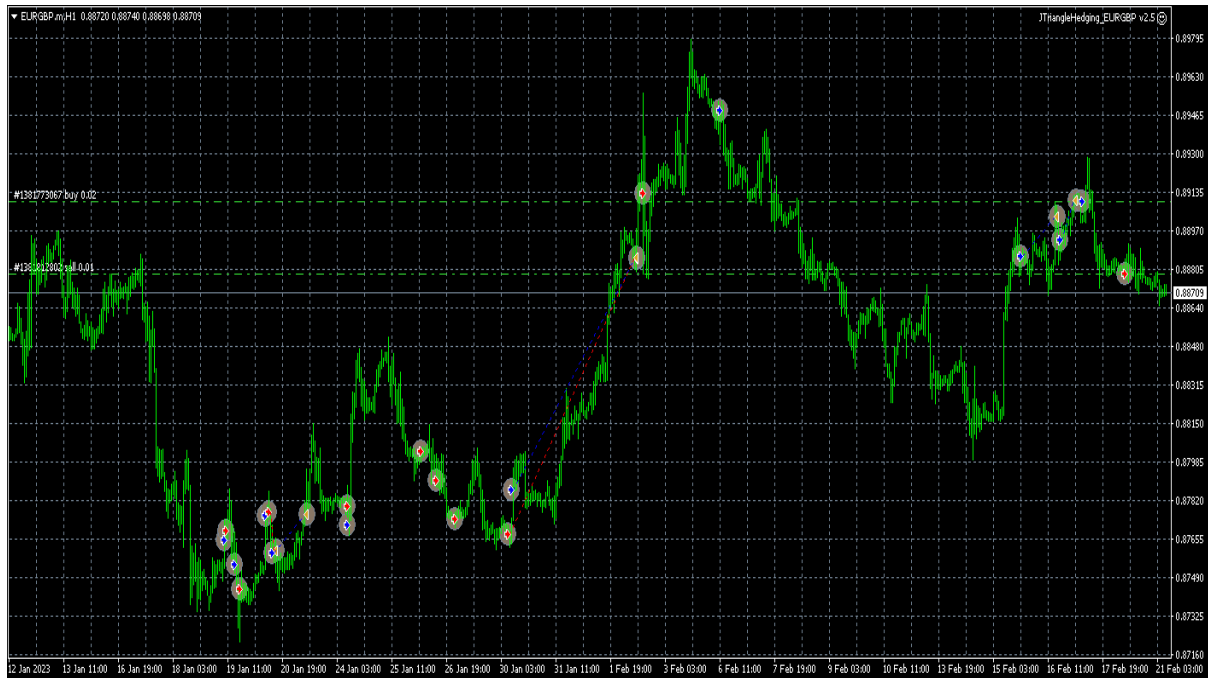


Figure 3. Buy and Sell Robot Openings on the EURGBP Pair

Order #	Time	Type	Size	Symbol	Price	S/L	T/P	Price	Commission	Swap	Profit
1381628607	2023.02.10 23:46:01	sell	0.02	eurjpy.m	140.268	0.000	0.000	143.436	-0.20	-0.27	-47.14 X
1381773067	2023.02.17 08:36:02	buy	0.02	eurgbp.m	0.89093	0.00000	0.00000	0.88699	-0.20	-0.36	-9.48 X
1381812266	2023.02.20 09:22:00	buy	0.02	gbpjpy.m	161.508	0.000	0.000	161.690	-0.20	0.03	2.70 X
1381812802	2023.02.20 09:43:01	sell	0.01	eurgbp.m	0.88786	0.00000	0.00000	0.88702	-0.10	0.03	1.01 X
1381823888	2023.02.20 16:55:00	sell	0.01	gbpjpy.m	161.248	0.000	0.000	161.710	-0.10	-0.08	-3.44 X
1381825121	2023.02.20 17:52:00	buy	0.01	eurjpy.m	143.302	0.000	0.000	143.424	-0.10	-0.04	0.91 X
1381832259	2023.02.21 05:01:01	buy	0.01	gbpjpy.m	161.698	0.000	0.000	161.690	-0.10	0.00	-0.06 X
Balance: 950.14 USD Equity: 892.95 Margin: 53.50 Free margin: 839.45 Margin level: 1669.07%											-57.19

Figure 4. Robot Cycle for EURJPY, GBPJPY and EURGBP Pairs

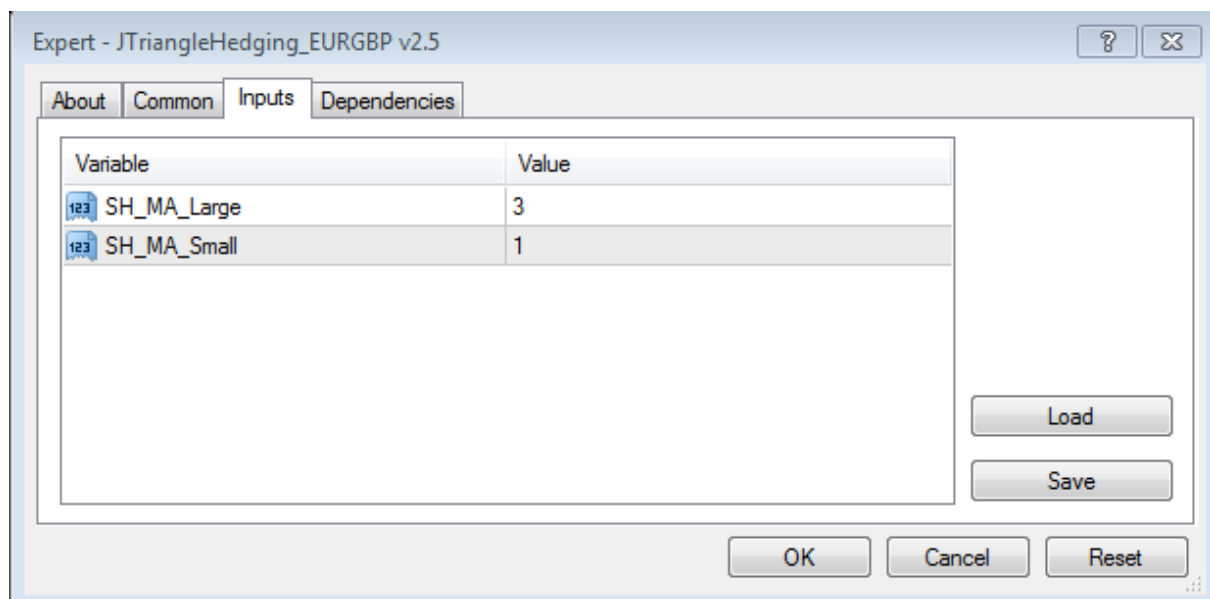


Figure 5. Robot UI

3.1.7. Algorithm Design

The algorithm in this robot uses indicators from technical analysis, namely the Moving Average (MA). Signals for Buy or Sell are based on the cross of two types of MA, namely large MA and small MA. This MA value can be set by the user using the provided UI. If there is an upward cross by the small MA against the large MA, then a signal to Buy will be generated (see Figure 6). Conversely, if there is a downward cross by the small MA against the large MA, a Sell signal will be generated (see Figure 7).

After a Buy or Sell signal is generated, the next algorithm is to follow the cycle. If the cycle is appropriate, Buy or Sell positions will be executed. If not appropriate, it will be ignored. For cycles, see Table 1.

```
(Cross(0, iMA(NULL, PERIOD_M1, SH_MA_Small, 1, MODE_EMA, PRICE_CLOSE, 1) > iMA(NULL, PERIOD_M1, SH_MA_Large, 1, MODE_EMA, PRICE_CLOSE, 1))
```

Figure 6. Buy signal

```
(Cross(1, iMA(NULL, PERIOD_M1, SH_MA_Small, 1, MODE_EMA, PRICE_CLOSE, 1) < iMA(NULL, PERIOD_M1, SH_MA_Large, 1, MODE_EMA, PRICE_CLOSE, 1))
```

Figure 7. Sell signal

3.2. Discussions

The design robot can perform the function as expected. The robot can start from any pair (the three pairs that have been set are EURJPY, GBPJPY or EURGBP). If the robot gets a signal from one of the pairs and there is no open position yet, the robot will execute the position. For example, if there is a Buy signal for the EURJPY pair, the robot immediately opens a Buy EURJPY position of 0.01 lots. Next, the robot will wait for the signal and adjust to the cycle. With the first Buy EURJPY position, the robot has two possibilities, namely opening a Sell EURGPB position or a Sell GBPJPY position. Apart from these signals, the robot will ignore them (see Figure 8 below). The orange arrows show the positions opened by the robot after a Buy GBPJPY position. By opening a Sell EURJPY and EURGBP position, one cycle has been completed and the condition that occurs is hedging.

When the user opens a position, the robot will wait for the signal according to the cycle and calculate the size of the position that is in accordance with that opened by the user. For example, if a user opens a Buy GBPJPY position of 0.02 lots, the robot will wait for a Sell EURJPY or Buy EURJPY signal. The robot will also adjust the opened lot size to 0.02 according to the user's lot size (see Figure 9 below). In Figure 9, the user opens a Buy GBPJPY position. This can be seen by the absence of the comment "Buy GBPJPY" which is a comment for the position opened by the robot, as shown by the orange arrow. Furthermore, the robot anticipates buying EURGBP worth 0.02 lots, according to the number of lots opened by the user.

If a TP has occurred for a certain pair, the robot will recalculate the cycle and lot size needed to hedge as a whole if there is a signal (see Figure 10). The robot opened the last position in the form of a Buy GBPJPY of 0.03 lots. This position was opened due to calculations made by the robot to anticipate a Buy EURGBP cycle with a total of 0.02 lots, and a Sell EURJPY of 0.01 lots, thus to do triangle hedging a Buy GBPJPY position of 0.03 lots is required. This is shown by the orange arrow in Figure 10.

Positions		
GBPJPY, buy 0.01 160.366 → 161.879		11.24
EURJPY, sell 0.01 140.497 → 142.770		-16.88
EURGBP, sell 0.01 0.88775 → 0.88192		7.00
GBPJPY, sell 0.01 157.557 → 161.904		-32.28
EURJPY, buy 0.01 142.326 → 142.753		3.17
EURJPY, buy 0.01 142.169 → 142.753		4.34
EURGBP, sell 0.01 0.88891 → 0.88192		8.40
GBPJPY, sell 0.01 157.948 → 161.904		-29.37
EURJPY, sell 0.01 140.674 → 142.770		-15.56
EURGBP, buy 0.02 0.89509 → 0.88172		-32.14
EURGBP, sell 0.01		13.65

Figure 8. Robot Open position after Buy GBPJPY Position

GBPJPY,m, buy 0.02 164.186 → 164.155		-0.46
2023.02.28 07:30		
S/L:	— Swap:	0.00
T/P:	— Taxes:	0.00
ID:	1382030156 Commission:	-0.20
EURGBP,m, buy 0.02 0.87894 → 0.87888		-0.15
2023.02.28 07:37, Buy EUR GBP		
S/L:	— Swap:	0.00
T/P:	— Taxes:	0.00
ID:	1382030333 Commission:	-0.20

Figure 9. Robot Open Position after Buy GBPJPY 0.02 Lot Position by User

Positions		
GBPJPY, buy 0.03 164.299 → 164.179		-2.64
GBPJPY, sell 0.01 164.171 → 164.197		-0.19
EURJPY, sell 0.01 142.664 → 144.333		-12.24
EURJPY, sell 0.01 143.244 → 144.333		-7.98
EURJPY, buy 0.01 143.347 → 144.316		7.10
EURGBP, buy 0.01 0.88297 → 0.87892		-4.88
EURGBP, buy 0.01 0.88283 → 0.87892		-4.71
EURGBP, sell 0.01 0.87919 → 0.87916		0.04
EURGBP, buy 0.01 0.88172 → 0.87892		-3.37

Figure 10. Robot Open Position for Triangle Hedging After TP

4. CONCLUSIONS AND SUGGESTIONS

4.1. Conclusions

The robot can open positions according to the existing signals, and can also complete the Triangle Hedging cycle properly. The robot manages to do TP for each pair and as a whole. The robot can interact properly according to the position opened by the user. The robot successfully performs Triangle Hedging according to the type of position and the lot size opened by the user. The robot can open as many cycles as the available free margin allows.

4.2. Suggestions

Robots need to be tested intensively to find out whether they can provide benefits or not in the medium and long term. This robot couldnot be tested using Strategy Tester that is provided by MetaTrader 4 Terminal, hence it should be tested using a demo and in a real time.

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REFERENCES

- [1] *Currency Trading for Dummies, 3rd Edition*. New Jersey: John Wiley & Sons.
- [2] *The Black Book of Forex Trading*. Alura Publishing.
- [3] *Day Trading and Swing Trading The Currency Market, Third Edition*. New
- [4] *Automated Trading with R: Quantitative Research and Platform*. Maryland: Apress.
- [5]. *Three Lines: Forecasting Forex Price Action*.
- [6] Jersey: John Wiley & Sons.
- [7]. *Expert Advisor Programming for MetaTrader 5 Creating Automated*
- [8] FAITH Software Life Cycle Model for Forex Expert
- [9] Stop Hunt Detection Using Indicators and Expert Advisor. *Journal of Physics: Conference Series* , 1-8.
- [10] Advisors. *Journal of Advances in Mathematical & Computational Sciences* , 1-12.
- [11] Developing a Forex Expert Advisor Based on Japanese Candlestick Patterns and Technical Trading Strategies. *International Journal of Trade, Economics and Finance* , 238-243.
- Trading Systems in the MQL5 Language*. Nashville: Edgehill Publishing.