Expert Advisor in Foreign Exchange Using Triple Moving Average Crossover Method

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Abstract
Forex (foreign exchange) is the activity of exchanging one currency for another for trading purposes. However, in forex trading, several problems can be faced such as human psychological factors, the trader's lack of experience and the ability to perform technical analysis. From these problems, an expert advisor is needed to help new traders to start their careers in forex. In this final project, the expert advisor was built by implementing the triple MA crossover method for the Metatrader 5 trading platform with the MetaQuotes Language 5 programming language and tested by doing backtesting with price data from January 1, 2019, to December 31, 2020 (2 years). The results obtained during 2 years of backtesting testing shows that expert advisor that was built made 86 transactions of which 75 resulted in profit and 11 transactions resulted in losses which made the expert advisor built to have a win rate of 87.21% and developed the capital of the trading account by 24.8%. In addition, the expert advisor also managed to make transactions that resulted in 24 consecutive profits with a total profit of 289.10 USD and 2 transactions that resulted in consecutive losses with a total loss of 101.28 USD.

Keywords: forex, pair, trader, Metatrader5, backtesting.

I. INTRODUCTION

Forex (Foreign Exchange) is a currency trading activity of two countries whose value changes from time to time[1]. In other words, forex trading is an activity of exchanging a pair of currencies. In today's millennial generation, anyone can take parts in forex trading. Forex trading itself is in great demand for many people because the liquidity of the market, which causes many people to see the forex market itself as a gold mine. Seeing the potential for money that can be made, many people start forex trading without having experience or information on what to do first, which causes most traders to make nothing in their trade and ends up losing their money. There are 2 factors, lack of ability to do technical analysis and trade by following one's own feelings. To help with this problem, we need a tool that can help traders perform technical analysis and open trade positions that are independent of the influence of human feelings, namely expert advisors.

Expert advisors (EAs) or often referred to as trading robots are computer programs that function as trade signals and automate trades on a pair[2]. Expert Advisors utilize embedded algorithms and methods to perform technical analysis, which is then used as a reference to open a buy or sell trade position in a pair. Expert Advisors work automatically, thereby eliminating the psychological element in the trading process, which is often the main reason a trade loses.

The development of expert advisors in this final project is based on previous studies that have been carried out with the aim of covering existing problems from previous expert advisors that have been built, in previous research, expert advisor development still uses the implementation of a combination of simple indicators and risk management techniques. Very high [3], using only patterns without using trend confirmation [2] and trading without indicators based on past price lists [4].

Based on previous research that has been reviewed, the application of the triple Moving Average (MA) crossover method is very good to be applied to expert advisors because the triple MA crossover method is a combination of three moving averages, two moving averages are used to give signals to open trade positions in conditions where the moving average is doing crossover and one more moving average is used as trendline and trend confirmation. The moving average itself can function as a stand-alone oscillator and serves to smooth out price fluctuations in the market[5].

Based on the problems described above, a tool or system is needed, namely expert advisors that can assist traders in conducting technical analysis and opening trade positions automatically. Therefore, an expert advisor was built that can automate the trading process by applying the triple MA crossover algorithm method.

II. MATERALS AND METHODS

2.1 Foreign Exchange

Foreign exchange (forex) is a foreign currency exchange transaction[1]. Multinational business activities usually use foreign exchange market to support their operation. Eventhough, investing has a risk so it needs an accuracy forex information to take the decision[6]. There are four things you should know about forex before starting forex trading that makes forex trading different from trading in other markets.

1) Regulation in forex, investors and traders are not bound by strict regulations like in other markets such as stocks because there is no institution that oversees the entire forex market.
2) Fees and Commissions Since the market is not regulated, how the broker charges fees and commissions will vary. Some use spreads and some use commission fee for each trade made.
3) Access Trading in the forex market has no time limit, traders can trade anytime for 24 hours except on weekends when no global financial centers are open
4) Leverage The forex market allows the use of leverage in trading, for example one can open an account with an initial capital of 1000 USD and can trade buy or sell positions of 50000 USD in a pair at a leverage of 50:1. But of course, leverage can be a double-edged sword because leverage can increase the profits obtained from trading results and also increase the losses that can be obtained.

2.2 Expert Advisor

Expert advisor is a forex trading automation system that gives traders the ability to execute trades automatically on a computer that is connected to a broker[2]. Expert advisor as a agent-based technology has important position in order to support financial trading [7]. This methos allows the trading can be made automatically [8]. Expert advisor using algorithmic trading to shift role of human [9]. In forex, expert advisors can serve to:

1) Opening a buy-sell position in forex trading and closing it.
2) Change the stop-loss position and take-profit target of the currently open trade position.
3) Perform analysis on pairs to predict market direction.
4) Sending notifications.
5) Perform financial management on accounts.

2.3 Moving Average

In forex, moving averages (MA) are one of the most common technical indicators used by traders for analysis. The moving average crossover method become a popular analysis tools in finacial market [10]. Moving averages are useful for smoothing price fluctuations and helping to distinguish between noise that can occur in the market [5]. Moving average often appears in several forms, such simple moving average, weighting moving average, and expontial moving average [11]. But in general, moving averages are divided into two types:

1) Simple Moving Averages (SMA)

   It is the simplest form of moving average, which is calculated by taking the arithmetic average of a given set of values. The SMA widely used in predicing stock and and financial trends [12]. The calculation of SMA is done by using the formula:

   $$SMA = \frac{A_1 + A_2 + \cdots + A_n}{n} \quad (1)$$

   Where:
   A = Average of the closing value
   n = Period

2) Exponential Moving Averages (EMA)

   These are moving averages that focus on current prices making them more responsive to new information. The calculation of EMA is done by using the formula:

   $$EMA_t = \left[V_t \times \frac{s}{1+n} \right] + EMA_y \times \left[1 - \frac{s}{1+n} \right] \quad (2)$$

   Where:
   EMAt = EMA Value
   Vt = Present value
   s = Smoothing
   EMAy = Past EMA value
   n = Period

2.4Overview of The EA

In the trading session, the EA continuously looks for trading opportunities and automatically opens trade positions when a trade opportunity arises.
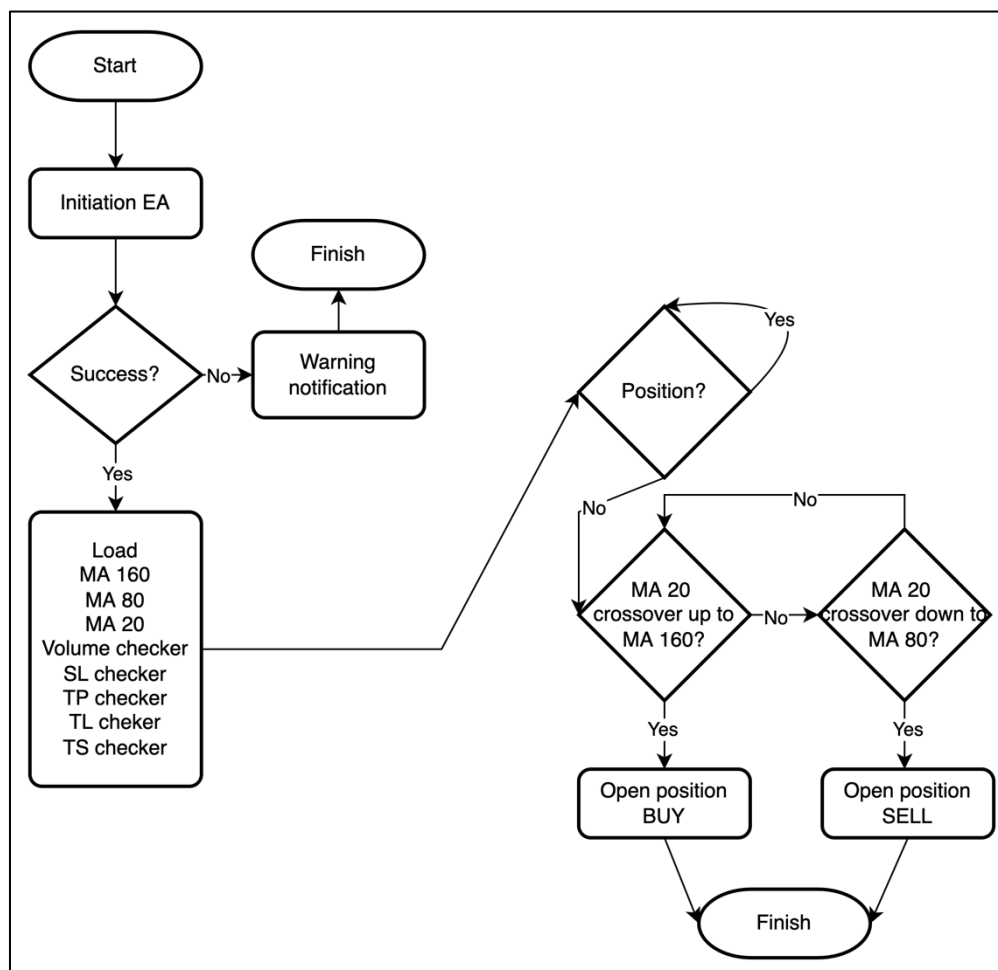

Figure 1: Flow Diagram of Expert Advisor

In the flowchart depicted in Figure 1, you can see the flow of the expert advisor's work from being inserted into the chart traded during the trading session. The activities carried out by expert advisors are divided into two as illustrated in the Figure 2.

1) Init

Occurs when an expert advisor is inserted into the chart you want to trade where the expert advisor will display a confirmation window to the user to approve the use of the expert advisor where if the user has agreed to use the expert advisor has been successfully installed

2) Ontick

Occurs after the Init process is complete where the Ontick activity occurs every time a new bar appears on the chart according to the type of chart timeframe used, for example on a chart with an M30 timeframe, the Ontick will be performed every 30 minutes.

Every 30 minutes, the expert advisor will look for opportunities to trade, then open a BUY trade position when the 20 MA crossovers above the 160 MA and SELL when the 20 MA crosses below the 80 MA.
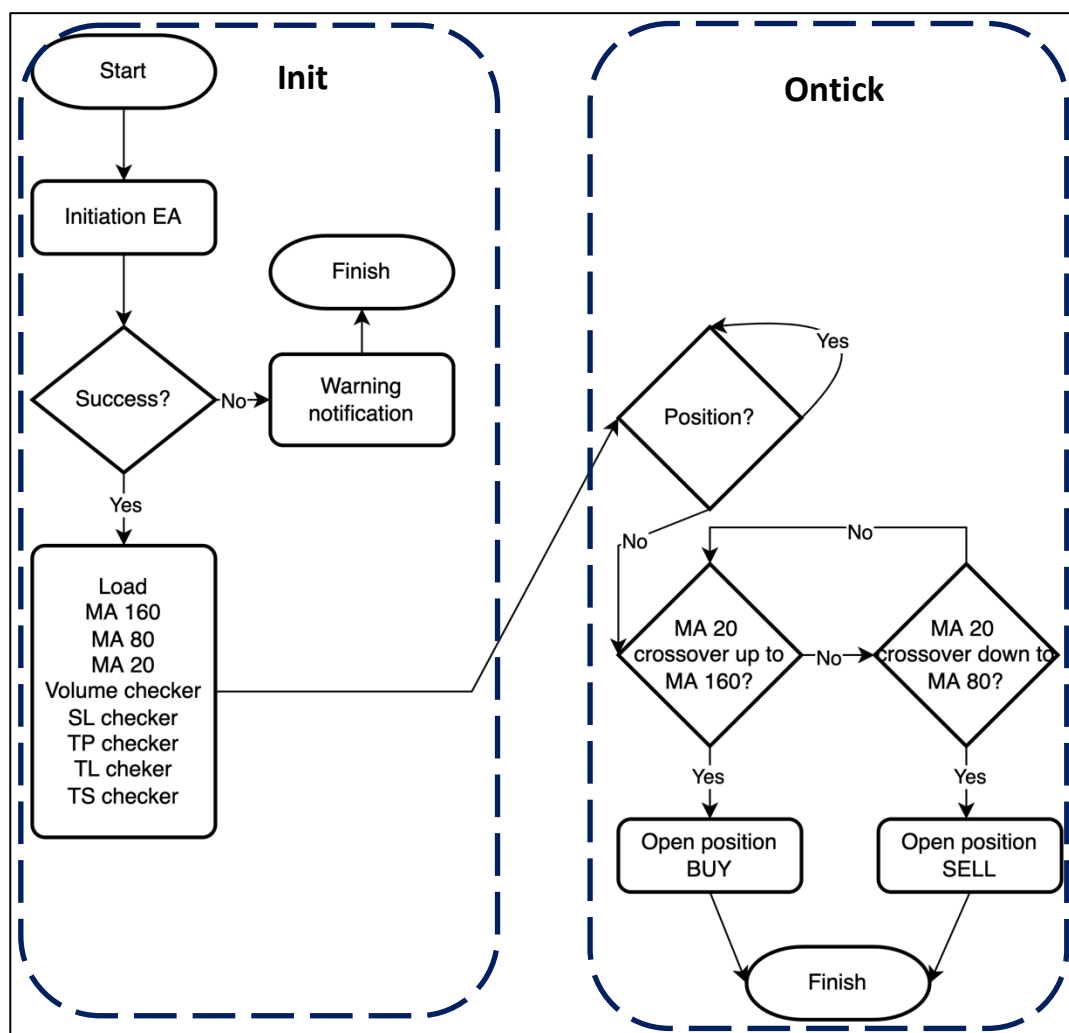
Figure 2: Activity of Expert Advisor

III. RESULTS AND DISCUSSION

In this part, will show the results of performance of expert advisor after conducting data testing. After two years of backtesting, expert advisor shows a good performance and can be profitable as shown in Table 1. And Table 2.

Table 1: Account Growth

Bars	24844
Initial Deposit	1000.00
Total Net Profit	248.01
Gross Profit	800.93
Gross Loss	-552.92

Based on Tabel 1, during testing with 2 years of data, EA grew a trading account with an initial deposit of 1000 USD by 24.8%, of which gross revenue during the trading session was 800.93 USD, gross loss of 552.92 USD and net income of 248.01 USD.

Table 2: Profit Trades

Profit Trades (% of total)	75 (87.21%)
Profit trade	36.23
Profit trade	10.68
Consecutive wins ($)	24 (289.10)

Tabel 2 showed that during testing with 2 years of data, the EA made 86 transactions where the EA made transactions that generated 75 times profit (87.21%) where the transaction with the largest profit was 36.23 USD and the average profit obtained from each transaction was 10.68 USD. In addition, EA also managed to make transactions that resulted in 24 consecutive profits with a total profit of 289.10 USD.

Table 3: Loss Trades

Profit Trades (% of total)	11 (12.79%)
Profit trade	-51.28
Profit trade	-50.27
Consecutive wins ($)	2 (-101.38)

Meanwhile, in Table 3, during testing with 2 years of data, EA lost 11 times (12.79%) where the biggest loss was 51.28 USD and the average loss of all transactions that resulted in a loss was 50.27 USD. In addition, the EA made 2 consecutive losses with a total loss of 101.38 USD.
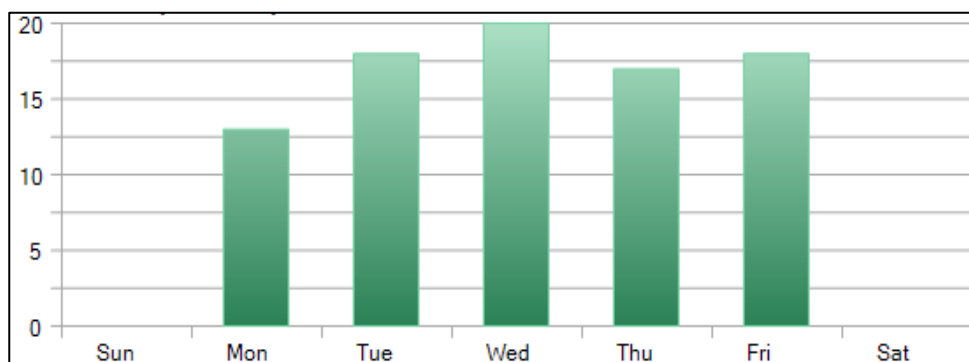
Figure 3: Daily Entry

As shown in Figure 3, by using and testing 2 years data, expert advisors make the most transactions on Wednesdays. On the other hand, from profit and loss perspective as shown in Figure 4, expert advisor produces positions that are closed with the most losses on Wednesday and most profits on Friday.
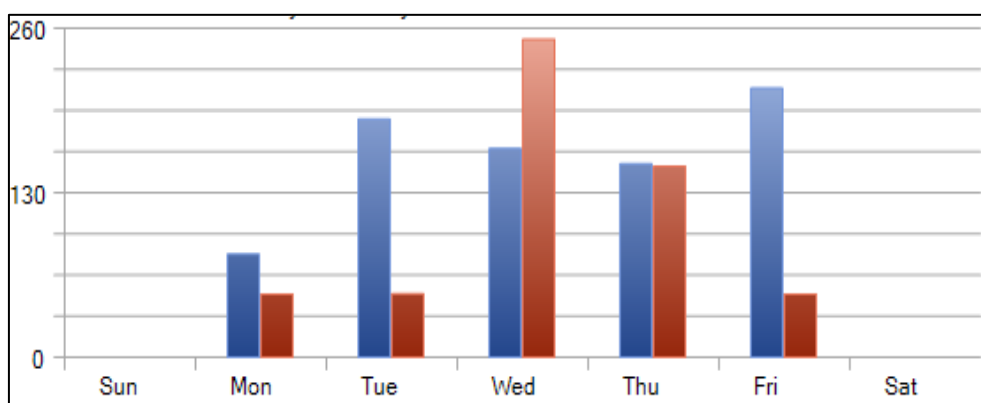
Figure 4: Daily Profit and Loss

IV. CONCLUSION

Expert advisor in forex using triple moving average crossover method has been presented in this paper. This method become a popular tools analysis to support business in financial market. After conducting series of research, gathering and testing data, it can be carried out that expert advisor showed a good performance. The traders can learn basic things in trading such as doing technical analysis and learning the triple MA crossover technique. Expert advisors that have been built can run well in normal market conditions. The trading automated by expert advisors has a high win rate (87.21% from 2 years of backtesting).

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