Jurnal Ekonomi Revolusioner
Vol 7, No 9, Januari 2024, Hal 40-45
ISSN: 24410685

EXPERT ADVISOR DEVELOPMENT UTILIZING RSI (RELATIVESTRENGTH INDEX) AND STANDARD DEVIATION INDICATORS IN FOREX TRADING ON USD/CAD CURRENCY PAIR

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Abstrak − Penelitian ini berfokus pada pengembangan dan evaluasi strategi perdagangan otomatis yang memanfaatkan indikator Relative Strength Index (RSI) dan Standard Deviation di pasar valas USD/CAD. Dengan menggunakan metode penelitian dan pengembangan (R&D) dengan pendekatan Waterfall yang terstruktur, penelitian ini memadukan pengujian ulang yang ekstensif dan pengujian waktu nyata pada platform MetaTrader 5. Proses pengujian ulang menunjukkan kemampuan strategi yang konsisten untuk menghasilkan laba di berbagai kerangka waktu, yang memperkuat keandalannya. Pengujian waktu nyata berikutnya semakin memvalidasi efektivitas strategi dalam kondisi pasar langsung, yang menunjukkan kemampuan beradaptasi dan kekokohannya. Analisis statistik, yang dilakukan melalui uji-T, menunjukkan tidak ada perbedaan signifikan antara hasil pengujian ulang dan pengujian waktu nyata di seluruh metrik kinerja utama, yang menggarisbawahi konsistensi strategi. Temuan tersebut menunjukkan bahwa integrasi indikator RSI dan Standard Deviation dalam kerangka perdagangan otomatis menawarkan metode yang dapat diandalkan untuk mencapai profitabilitas berkelanjutan di pasar USD/CAD. Strategi ini direkomendasikan untuk implementasi penuh dalam perdagangan valas dan layak dikembangkan lebih lanjut untuk mengoptimalkan kinerja dan profitabilitas jangka panjangnya.
Kata Kunci: Trading Forex, Metatrader 5, Standard Deviation, Relative Strength Index, USD/CAD, Trading Algoritmik.

Abstract *− This research focuses on the development and evaluation of an automated trading strategy utilizing the Relative Strength Index (RSI) and Standard Deviation indicators in the USD/CAD forex market. Employing a research and development (R&D) method with a structured Waterfall approach, the study integrates both extensive back testing and real-time testing on the MetaTrader 5 platform. The back testing process demonstrated the strategy's consistent ability to generate profits across multiple timeframes, reinforcing its reliability. Subsequent real-time testing further validated the effectiveness of the strategy in live market conditions, showcasing its adaptability and robustness. Statistical analysis, conducted through the T-test, indicated no significant differences between the back testing and real-time testing results across key performance metrics, underscoring the strategy's consistency. The findings suggest that the integration of RSI and Standard Deviation indicators within an automated trading framework offers a dependable method for achieving sustained profitability in the USD/CAD market. This strategy is recommended for full implementation in forex trading and merits further development to optimize its long-term performance and profitability.*
Keywords*: Forex Trading, Metatrader 5, Standard Deviation, Relative Strength Index, USD/CAD, Algorithmic Trading.*

INTRODUCTION

Globalization is a complex, multifaceted phenomenon involving various dimensions such as economic, technological, and market aspects. It refers to the increasing global economic integration facilitated by the movement of goods, services, capital, labor, and technology across borders. As globalization progresses, the adoption of digital technology also tends to rise. Policies aimed at accelerating digital technology uptake should focus on enhancing the globalization index to promote knowledge dissemination and boost competitive forces (Skare & Riberio Soriano, 2021). This intricate process, driven by human innovation and technological advancement, leads to the expansion of global trade through the reduction or elimination of trade barriers like import tariffs.

Skare & Riberio Soriano (2021) argue that globalization is a crucial channel through which digital technology penetration impacts innovation and significantly influences global competition and multifactor productivity. The dynamics of globalization underscore the interconnected nature of the global economy, shaping modern international economic relations. The interplay of economic forces, technological progress, and barrier removal drives the ongoing evolution of this global phenomenon. As countries become increasingly interconnected, the effects of globalization permeate various sectors, affecting trade patterns, economic policies, and the global market's overall structure.

The development of the international economy and investment is shaped by multiple factors, including the historical trajectory of economic globalization, technological advancements, and human innovation. This process has provided consumers with a broader range of goods at lower prices and stimulated job creation, especially in developing countries. Despite the challenges and disparities in global economic growth, there are opportunities for investment and economic development. Countries must focus on maximizing the benefits of incoming investment flows and exploring the feasibility of redistributing these investments across regional groups to foster economic growth. Efforts should also be made to enhance investment, tax, and exchange rate policies to effectively manage foreign economic activities (Trusova et al., 2022).

The foreign exchange (Forex) market is one of the largest financial markets globally. Accurate exchange rate predictions can provide investors with valuable insights to make informed decisions, enhance returns, and mitigate risks (Hu et al., 2021). The Forex market facilitates currency buying, selling, exchanging, and speculation, enabling currency conversion for international trade settlements and investments. It operates 24 hours a day, 5.5 days a week, handling trillions of dollars in daily trading activity. Unlike a single centralized market, the Forex market comprises a global network of computers and brokers.

This study uses Deriv as the chosen broker, a trusted platform used by traders worldwide. Deriv Broker offers a diverse range of markets, including forex, commodities, stocks, ETFs, cryptocurrencies, and other financial markets. With over two decades of experience and compliance with global regulations, Deriv operates under five entities and provides eight proprietary platforms tailored to various trading needs. The broker offers a comprehensive selection of deposit and transaction options and access to various trader tools, such as margin, swap, pip, PnL, and multipliers calculators. Deriv also provides Deriv MT5 signals for copy trading and maintains a blog with market reports and educational articles on topics like Forex, Commodities, and Strategies and Tips (Deriv, 2023).

The Forex market's unique characteristics include its large trading volume, geographical dispersion, continuous operation, and the variety of factors influencing exchange rates. It offers numerous trading options, including long and short positions, contracts of various sizes and currencies, and varying leverage degrees. The Forex market consists of three key types of markets: the spot forex market, the forward forex market, and the futures forex market.

Traders in the Forex market can buy, sell, or exchange currencies for hedging and speculative purposes, often trading large amounts of currency with a margin for leverage. The market is characterized by high liquidity, real-time currency price quotes, and a decentralized structure with no central oversight. Trading, a fundamental element of financial markets, involves acquiring and selling financial instruments to achieve financial gain. This complex activity encompasses a range of assets, including stocks, shares, funds, and currencies, with various strategies, including day trading.

Algorithmic trading within Forex involves using automated strategies and expert advisors to execute trades based on predefined rules and algorithms. This method allows traders to automate manual trading strategies, saving time and effort and reducing susceptibility to human errors. Algorithmic trading represents a shift towards leveraging

technology to enhance precision and efficiency in financial markets. It streamlines trade execution, optimizes outcomes through systematic algorithm application, and fosters a disciplined, rule-based trading environment. This integration reflects a strategic response to the evolving financial landscape, where technology and trading methodologies intersect to achieve competitive advantages. Algorithmic trading aligns with the focus on leveraging technological advancements to boost operational efficiency, achievable through Expert Advisors.

Expert Advisors (EAs) are automated applications that help traders execute transactions in the Forex market without constant oversight. These programs follow predefined rules and strategies, minimizing the need for manual trading and allowing traders to focus on other responsibilities. MetaTrader 5 (MT5) is a popular platform for deploying expert advisors, offering a user-friendly interface and robust toolkit for creating, testing, and implementing automated strategies. MT5 supports various trading instruments and timeframes, catering to diverse trader needs. The development of expert advisors relies on MetaQuotes Language 5 (MQL5), a programming language for crafting automated trading strategies compatible with MT5. MQL5's power and flexibility enable traders to create complex algorithms and implement various trading strategies, covering technical analysis, risk management, and custom indicator creation.

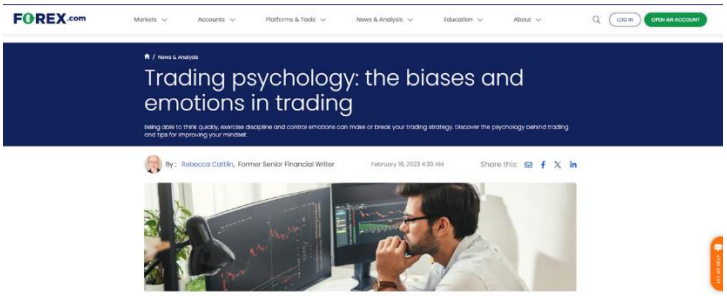

Figure 1. Articles about the significance of mental attitude for traders.
Source : https://www.forex.com, 2023

RESEARCH METHODS

The type of research employed to achieve the objectives of this study is the research and development (R&D) method. Research and development (R&D) constitutes a systematic and innovative process with the goal of advancing knowledge boundaries and discovering new applications for existing knowledge. R&D encompasses three main activities: basic research, applied research, and experimental development.

Using an Expert Advisor to implement an automated trading strategy on the USD/CAD currency pair on the hourly and four-hourly time frames, the Research and Development (R&D) method is used to develop and assess the efficacy of the trading research indicators used, namely the Relative Strength Index (RSI) and Standard Deviation. Because R&D research combines technology development with scientific study, it is highly relevant.

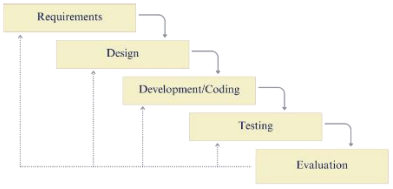

Figure 1. Waterfall Diagram
Source : (Cohn, Sim, & Lee, 2009)

In the process of developing Expert Advisors (EAs) for forex trading, Research and Development (R&D) takes on a structured approach, striving to craft more advanced, efficient, and profitable EAs for traders. This involves systematically designing research to grasp and analyze the research focus, particularly in the development of the Expert Advisor MT5 using RSI and Standard Deviation indicators.

The methodology that will be followed for this research is a variant of the R&D method. It follows successive development and testing in a Waterfall approach for the USD/CAD forex market EA. First, a technical analysis is performed in order to collect the historical price data and check the feasibility of the indicators RSI and Standard Deviation for forecasting the movement of the price. This first step also entails needs analysis to capture the limitations and prerequisites for seamless integration of the EA. During the design phase, detailed planning of the creation of the EA is carried out regarding customization of the trading algorithm, while defining the technical software requirement for the job. The design integrates the RSI and Standard Deviation indicators accordingly with their parameters configured and the proper trading logic. Following that, EA is to be programmed in programming language MetaQuotes Language 5, or more specifically, MQL5, which has similarities with C++. For this purpose, MetaEditor 5 is used. This language would be used to compile the code of the EA before it goes into testing. Historical price data testing and real-time testing are part of the testing involved in seeing the performance of the EA. Initial trials are run in limited fashion to improve the EA continuously, where improvements are built upon further.

Further validations of its performance are extended to a broader test using various metrics: performance factor, expected payoff, Sharpe ratio, and drawdown. Descriptive statistics and T-test should be done in a pairwise manner to measure differences in performance between backtesting and real testing. Finalization of the Expert Advisor would ensure that the trading strategy developed is proper and correct. This includes backtesting for the comparison of trading results with historical data and statistical tests for checking the validity in development of the EA, which would be required to generate proper and profitable trading signals based on the RSI and Standard Deviation indicators. The results presenting and discussion in expert forums conclude the research, underlining the software engineering of the EA and its practical usage in the forex market.

RESULTS AND DISCUSSION

The research and development (R&D) method used in this study aims to evaluate and test the Expert Advisor developed using the technical indicators Relative Strength Index and Standard Deviation on the USD/CAD currency pair. To ensure the collected data can be effectively utilized and to avoid the risk of data inconsistency, backtesting and real-time testing were conducted over a specified period.

Based on the statistical analysis results during Scenario 1 over a one-month testing period (from May 29, 2024, to June 29, 2024), it was found that there was no significant difference between backtesting and real-time testing in terms of the profit and total deal trade variables. However, a significant difference was observed in the balance variable. This difference indicates a discrepancy in account balance between backtesting and real-time testing on the H1 (hourly) time frame.

The test results obtained in Scenario 1 indicate that the T-test's significance value (2-tailed) for the profit variable is 0.941, which is greater than 0.05. This value indicates that there is no significant difference in the average profit generated by backtesting and real-time testing on the H1 time frame. The mean profit from backtesting was 936,5455, while the mean profit from real-time testing was 1,036,6460. Although the profit generated in real-time testing was higher than in backtesting, the difference is not substantial.

Furthermore, the significance value for the balance variable in the T-test was 0.000,

which is less than 0.05. This result indicates a significant difference in the average balance variable generated by backtesting and real-time testing on the H1 time frame. The mean balance in backtesting was 10,214,0909, while the mean balance in real-time testing was 10,150,7750. Although the balance value in backtesting was higher than in real-time testing, the difference is not substantial.

Additionally, the T-test significance value for the total deal trade variable was 0.748, which is greater than 0.05. This result indicates that there is no significant difference in the average total deal trade generated by backtesting and real-time testing. The mean total deal trade in backtesting was 6.0000, while the mean total deal trade in real-time testing was 5.5000. The total deal trade value generated in backtesting was higher than in real-time testing, but the difference was not significant.

In Scenario 2, statistical analysis conducted over a one-month testing period (May 29, 2024 - June 29, 2024) showed no significant differences between backtesting and real-time testing on the H4 (four-hour) time frame for the profit, total deal trade, and balance variables. The T-test significance value (2-tailed) for the profit variable was 0.932, which is greater than 0.05, indicating no significant difference in the average profit generated by backtesting and real-time testing on the H4 time frame. The mean profit from backtesting was 595.1847, while the mean profit from real-time testing was 670.8253. Although the profit generated in backtesting was lower than in real-time testing, the difference is not substantial.

Moreover, the significance value for the balance variable in the T-test was 0.000, which is less than 0.05. This result shows a significant difference in the average balance variable generated by backtesting and real-time testing on the H4 time frame. The mean balance in backtesting was 10,106,9559, while the mean balance in real-time testing was 10,107,7547. Although the balance value in backtesting was lower than in real-time testing, the difference is not substantial. Meanwhile, the T-test significance value for the total deal trade variable was 0.561, which is greater than 0.05. This result indicates that there is no significant difference in the average total deal trade generated by backtesting and real-time testing. The mean total deal trade in backtesting was 9.0000, while the mean total deal trade in real-time testing was 8.0000. The total deal trade value generated in backtesting was higher than in real-time testing, but the difference was not substantial.

Overall, the performance testing of the trading strategy through the Expert Advisor in Scenario 2, developed using the Relative Strength Index and Standard Deviation indicators on the USD/CAD currency pair with an H4 time frame, was able to demonstrate a good similarity between backtesting and real-time testing.

CONCLUSION

The RSI and Standard Deviation indicator automated trading strategy has so far successfully helped hedge the forex market risk of USD/CAD. Five years of backtesting, combined with one month of real-time strategy testing, showed good and consistent profitability. Statistical analysis through the t-test found no significant differences in profits and balance between backtested and real-time results, although the differences in the number of trades tend to show the impact of real-time market conditions. The strategy performance metrics of the EA were impressive; thus, in performing a backtest on the H1 timeframe, it would return an expected payoff of 21.35, a Sharpe ratio of 0.38, and a profit factor of 1.19. The results for the H4 timeframe were also quite good: the expected payoff constituted 16.70, the Sharpe ratio was 0.58, and the profit factor came to 1.27. This EA works great for making stable profits; at the same time, it should be optimized concerning drawdown and further improvement of the risk-adjusted return. Generally, this strategy gives a decent skeleton to forex trading and surely can be developed further.

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