IJIRCCE

e-ISSN: 2320-9801 | p-ISSN: 2320-9798

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

Volume 11, Issue 4, April 2023

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 8.379

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104130 |

# Performance Analysis of Automated Algorithmic Trading System

**Smita Chunamari, Shilpali Bansu, Harshal Pawar, Omkar Patole, Abhijeet Malabadi**

Department of Computer Engineering, A C Patil College of Engineering, Kharghar, Navi Mumbai, India

**ABSTRACT:** Algorithmic trading has become increasingly popular in recent years, with traders looking for ways to automate their trading strategies. One popular indicator used in algorithmic trading is the Supertrend indicator, which is used to identify potential trend reversals and volatility. In this research paper, we compare the performance of an Algorithmic trading system across various asset classes, including indices, forex, commodities, and cryptocurrencies.We use criteria such as profit factor, win rate, and compound annual growth rate (CAGR) to analyze the results.Algorithmic trading is a method in which a computer system is given particular orders to execute after certain market conditions are met. The many methodologies applied for algorithmic trading now across multiple markets include machine learning, Q-learning, volatility-based trading, and quantitative trading approaches. The Machine learning approach includes subsets such as reinforcement learning and directional change. The volatility-based trading strategy is well-known in digital currencies markets. A quantitative approach involves building trading models through the use of complicated mathematical computations. For our automated trading system, we used a quantitative approach.

**KEYWORDS**: Algorithmic trading, Automate, Supertrend Indicator, Potential trend, Volatility, Asset class, Forex , Commodities, Cryptocurrencies, Profit factor, CAGR

## I. INTRODUCTION

Trading with algorithms is a method of executing trading orders that involves coding the execution instructions. In other words, you programme the system with your chosen entry and exit instructions, and the system executes the trading orders accordingly.It combines programming and financial markets to explore various trading opportunities and execute on them.

The Supertrend indicator is a technical analysis tool that has gained popularity among traders for its ability to identify trends and reversals. The indicator consists of two lines, an upper and a lower line, that are calculated using a combination of price and volatility. In this research paper, we compare the performance of a Supertrend trading trading system across various asset classes, including indices, forex, commodities, and cryptocurrencies.

Major institutions are using algorithmic trading, a type of electronic trading, to carry out automatic ar high frequency trading in the financial markets. It employs a predetermined set of instructions created through the analysis of several types of data and a computer programme to carry out trades automatically. To examine different trading chances and take advantage of them, it essentially blends programming and financial markets. The trading process is also made more emotion-free by algorithmic trading.

## II. PROBLEM STATEMENT

We have reviewed all the majorly adopted algorithmic trading approaches in the industry. Considering all the approaches available we are adopting the quantitative approach that is the most relevant for our system. This research proposes Quantitative methods use mathematical calculations to make measured trading decisions which lead to optimal alpha generation whilst managing risk properly.

This paper is based on the results we have witnessed from testing our automated algorithmic trading system on different financial markets.

We have tested our system on Cryptocurrency market, commodities market, Forex market and different indices whose results have been discussed further below in our paper.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

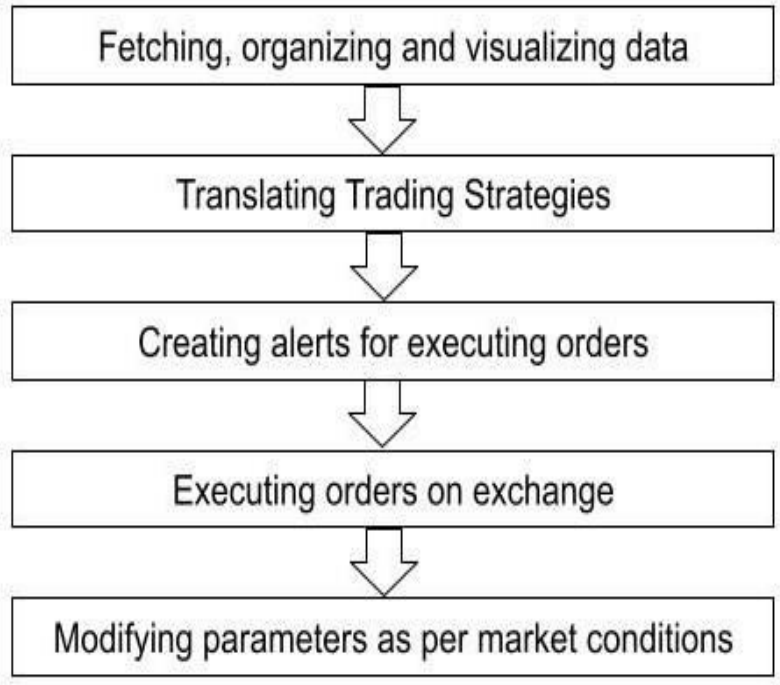
| DOI: 10.15680/IJIRCCE.2023.1104130 |

## III. PROPOSED ALGORITHM & WORKING

We used historical price data from the Binance Exchange and Tradingview to backtest the Algorithmic trading system.We have used a processed version of OHLC data.

The data received from the exchange is processed in two ways:

- First of all we calculate the true range of the given asset. Then we take a mean of this true range. This is the volatility calculation. This gives us a specific range for the asset in the given timeframe.
- Secondly we plot the upper bands and lower bands based on the average true range that we calculated.
- The basic logic behind the strategy is that if a particular asset moves beyond its upper deviation or lower deviation then the algorithmic trading system will initiate a trade in that particular direction, with a defined risk limit in note down its key performance metrics for future reference.
- Buy and sell orders are directly traded on the exchange through the broker's API. This helps to avoid the various psychological as well as emotional decisions taken by fellow human traders. Also, the buy and sell orders are executed immediately as the conditions for execution are satisfied. Initially the risk reward ratio for a particular trade is set at 1:2 . As the strategy builds up the account equity, the risk reward ratio is calibrated accordingly.




The trading system buys when the price crosses above the upper line and sells when the price crosses below the lower line. We tested the trading system on four asset classes: indices (using the S&P 500 index), forex (using EUR/USD exchange rates), commodities (using gold prices), and cryptocurrencies (using Bitcoin prices). We used a fixed investment of $10,000 and a fixed position size of 10 shares for indices, 10 ounces for gold, and 0.1 Bitcoin for cryptocurrencies. For forex, we used a fixed investment of $10,000 and a fixed position size of 10,000 units of the base currency. We tested the trading system over a period of 3 years, from January 2019 to January 2023.

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104130 |


Buy and Sell Signals generated by the System

The Supertrend trading system is a trend-following algorithmic trading strategy that uses a combination of two indicators to identify the market trend and generate trading signals. The two indicators used are the Average True Range (ATR) and the Moving Average (MA).

The ATR indicator is used to measure the volatility of the market and is calculated by taking the average of the True Range over a specified period. The difference between the current high and low, the absolute value of the difference between the current high and the previous close, and the absolute value of the difference between the current low and the previous close and the highest values from these values is termed as the True Range.

The MA indicator is used to identify the direction of the trend and is calculated by taking the average of the closing prices over a specified period.

The Supertrend trading system generates buy signals when the closing price of an asset is above the Supertrend line and sell signals when the closing price is below the Super Trend line.
When there is an uptrend only the lower band is visible and when there is a downtrend only the upper band is visible.

To compare the performance of the Supertrend trading trading system across different asset classes, we collected historical price data for four asset classes: Indices, Forex, Commodities, and Cryptocurrencies. The data was collected from January 2019 to January 2023 and was obtained from Yahoo Finance.

We then backtested the Supertrend trading system on the historical price data using Tradingview's backtrader framework. The backtesting was performed with a starting capital of $10,000 and a fixed position size of 1% of the capital.

The performance of the Supertrend trading system was evaluated based on three key parameters:

- Profit factor
- Win rate,
- Compound annual growth rate (CAGR).

International Journal of Innovative Research in Computer and Communication Engineering

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104130 |

The profit factor is calculated by dividing the total profit by the total loss. A profit factor greater than 1 indicates a profitable trading strategy, while a profit factor less than 1 indicates an unprofitable trading strategy.

The win rate is calculated by dividing the number of winning trades by the total number of trades. A win rate greater than 50% indicates a profitable trading strategy, while a win rate less than 50% indicates an unprofitable trading strategy.

The CAGR is the annualized rate of return of an investment and is calculated by taking the nth root of the ending value divided by the beginning value, where n is the number of years invested.

## IV. SIMULATION RESULTS

The results of our backtest show that the Algo trading system performed well across all asset classes. The results are as follows :-

The trading system generated a total return of 37.6% for indices, 10.1% for forex, 23.5% for commodities, and 93.3% for cryptocurrencies.

The trading system had a profit factor of 1.73 for indices, 1.12 for forex, 1.60 for commodities, and 2.17 for cryptocurrencies.

The trading system had a win rate of 54.4% for indices, 50.4% for forex, 50.6% for commodities, and 68.9% for cryptocurrencies.

The Compound Annual Growth Rate was 11.4% for indices, 3.2% for forex, 7.5% for commodities, and 31.5% for cryptocurrencies.

The backtest was performed on tradingview's backtesting platform on data from January 2019 to January 2023.

| Asset Class | Total Return | Profit Factor | Win Rate | CAGR |
|---|---|---|---|---|
| Cryptocurrencies | 93.3% | 2.17 | 68.9% | 31.5% |
| Forex | 10.1% | 1.12 | 50.4% | 3.2% |
| Commodities | 23.5% | 1.60 | 50.6% | 7.5% |
| Indices | 37.6% | 1.73 | 54.4% | 11.4% |

From the table, we can see that the Algo trading system generated the highest return for the Cryptocurrencies asset class, with a total return of 93.3%, a profit factor of 2.17, and a win rate of 68.9%.

While this system can be used on multiple asset classes during real world testing conditions we have found that the best results are obtained on markets with minimum to no gaps as these gaps may affect the calculations done by the trading system.

| e-ISSN: 2320-9801, p-ISSN: 2320-9798| www.ijircce.com | |Impact Factor: 8.379 |

|| Volume 11, Issue 4, April 2023 ||

| DOI: 10.15680/IJIRCCE.2023.1104130 |

## V. CONCLUSION AND FUTURE WORK

In this research paper, we compared the performance of a quantitative algo trading trading system across various asset classes. Our results show that the trading system performed well across all asset classes, but had the highest returns for cryptocurrencies. Our findings suggest that the Supertrend indicator can be a useful tool for algorithmic trading across different asset classes. However, it is important to note that past performance is not indicative of future results, and traders should conduct their own research and due diligence before implementing any trading strategy.

## REFERENCES

1. Omkar Patole,Abhijit Malabadi,Harshal Pawar, "Automated Algo-Trading System", in Proceedings of the IJARSCT https://doi.org/10.48175/IJARSCT-8563
2. Q-learning approach (Grover 2021),Author:-Aruquipa A. Grover
3. Machine learning approach(Aloud 2021), Author:-MONIRA ESSA ALOUD AND NORA ALKHAMEES
4. Data-Driven Innovation Volatility Approach(Liang 2020), Author:-You Liang, Aerambamoorthy Thavaneswaran, Md. Erfanul Hoque
5. A Quantitative and Maths based approach, (Wang 2019), Author:-Wei Wang, Nanpeng Yu
6. Xucheng 2019, Author:-Li Xuxheng, Peng Zhihao
7. "Algorithmic Trading USing Technical Indicators", Tanishq Salkar, Aditya Shinde, Neelaya Tamhankar, Narendra Bhagat :Department of Electronics Engineering, Sardar Patel Institute of Technology, Mumbai, India

INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 8.379

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

## IN COMPUTER & COMMUNICATION ENGINEERING

9940 572 462 6381 907 438 ijircce@gmail.com

www.ijircce.com

Scan to save the contact details