

TRADING ANALYSIS

Project - 1

Submitted By:

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in partial fulfillment for the award of the degree of

**BACHELOR OF TECHNOLOGY IN COMPUTER
SCIENCE & ENGINEERING**

under the supervision of

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Declaration

I, **Manik Jain (Enrollment No. 2019-310-070)**, hereby declare that this project work titled “Trading Analysis” is carried out by me in the Department of Engineering Computer Science, School of Engineering Sciences & Technology of Jamia Hamdard, Delhi.

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Certificate

On the basis of the declaration submitted by **Mr. Manik Jain(Enrolment No.: 2019-310-070)** of Bachelor of Technology, Computer Science and Engineering I hereby certify that the project titled “**Trading Analysis**” being submitted to the Department of Computer Science and Engineering, Jamia Hamdard, New Delhi in partial fulfillment of the requirements for the award of degree **Bachelor of Technology, Computer Science and Engineering** is carried out by her under my supervision.

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Mr. Shah Imran Alam
(Supervisor)



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I would like to convey my heartfelt gratitude to Mr. Shah Imran Alam for his tremendous direction, support and guidance in the completion of my project. His suggestions and feedback have helped me a lot in improving the quality of the project.

• ABSTRACT

This project is aimed at creating an algorithm that can predict the movement of the price using combinations of various mathematical trend predicting functions. Standard tools will be used which are easily available to all, and with some modifications, they can accurately predict price movement. The objective is to predict prices in order to make more informed and accurate investment decisions, be it buying or selling. I propose a financial market asset price prediction system that integrates mathematical functions to achieve better stock prediction accuracy and issue profitable trades.

The model created herein is for intraday traders, the traders who open and hold positions for very short periods. This type of trading is also known as scalping, and it is considered to be one of the most difficult forms of trading in the financial markets. Inexperienced traders can easily get liquidated if they do not understand its ins and outs. Even experienced traders do not dabble in it on a regular basis. Only when one has a reliable strategy or system that can help one in understanding price action, it is then that it can generate profits. The model herein tries to help in the aforementioned circumstances by providing accurate investment decisions.

• INTRODUCTION

The financial market is a dynamic and composite structure where people can exchange cryptographic types of cash, cash matches, stocks, values and auxiliaries over virtual stages maintained by mediators. The stock market grants monetary benefactors to guarantee segments of public associations through trading either in terms of professional career or over-the-counter business areas. The cryptocurrency market licenses monetary supporters to have different cryptographic types of cash, directing tokens, IDOs, etc. These business areas have permitted monetary sponsor the chance of gaining cash and having a prosperous life through powerful cash the executives minimal beginning proportions of money, for the most part safe stood out from the bet of beginning new business or the need of huge pay job. Both these business areas are affected by numerous factors causing weakness and high capriciousness watching out. In spite of the way that individuals can take orders and submit them to the market, robotized trading structures (ATS) that are worked by the execution of PC tasks can perform better and with higher power in submitting orders than any human. Regardless, to evaluate and control the introduction of ATSs, the execution of chance methods and security gauges applied considering human choices are required. Numerous factors are solidified and contemplated while encouraging an ATS, for instance, trading method to be taken on, complex mathematical limits that reflect the state of a specific stock, AI estimations that engage the assumption addressing things to come stock worth, and unequivocal news associated with the stock being poor down.

For learners, every one of this transforms into an immense hindrance. Where does one start? What all does one need to know? Likewise, paying little heed to getting data and experience, there is no confirmation that one will really need to make benefits. To overcome this, there are various gadgets set up which could help in market assessment, regardless, that additionally includes no assurance.

Associations basically run on purchaser faithfulness and client reviews about their things. Changes in assessment through virtual diversion have been shown to associate with shifts in stock business areas. Recognizing client protests and in this manner settling them prompts shopper dependability as well as the unwavering quality of an affiliation. In today's ongoing situation where we're honestly encountering data over-trouble (but this doesn't mean better or more significant pieces of information), associations could have piles of client analysis accumulated; yet

for straightforward individuals, it's at this point challenging to take apart it genuinely. Whether or not an individual can look at these impossibly goliath heaps of data, the issue of human bumble will regardless be there.

In "day trading", or the more exact term, intraday trading, this is simply unrealistic. With the amount of trades that one does every single day, it is over the top to hope to screen all assets, their market assessment, and cost movement. To supplant this issue, math can have a significant effect in creating computations that can give encounters in market feeling as well as cost improvement ceaselessly, without the need of separating a lot of evident data. Thusly, the essential purpose in this endeavor is to make and execute a computation that can give endlessly precise trading signals using flitting market data of an asset, be it a cryptocurrency, forex, security, stock, record, or ETF.

AVAILABLE TOOLS

Trading as we know it is not possible without the use of mathematical tools. Whether one is interested in cryptocurrency trading, forex trading, commodities trading or stock trading, it can be helpful to use technical analysis as part of one's strategy or system and this includes studying various trading indicators. Technical analysis is the study of price charts to identify underlying trends, patterns and henceforth to predict price movement. It may not necessarily include the analysis of market sentiments/news. Trading indicators are mathematical calculations, which are plotted as lines on a price chart and can help traders identify certain signals and trends within the market. There are different types of trading indicators, and they can be broadly divided into two categories:

- Lagging indicators
- Leading indicators

A leading indicator is a forecast signal that predicts future price movements, while a lagging indicator looks at past trends and indicates momentum of a trend and the direction in which it might go. Some of the most popular technical indicators that traders use on a regular basis are as follows:

- Moving average (MA)
- Exponential moving average (EMA)
- Moving average convergence divergence (MACD)
- Relative strength index (RSI)
- Volatility Oscillator (VO)

WHAT THESE TOOLS MEAN:

Moving Average (MA): The MA – or ‘simple moving average’ (SMA) – is an indicator used to identify the direction of a current price trend, without the interference of shorter-term price spikes. The MA indicator combines price points of a financial instrument over a specified time frame and divides it by the number of data points to present a single trend line. It is a lagging indicator. The formula for it is as follows:

$$MA = \frac{C_1 + C_2 + C_3 + C_4 + \dots + C_n}{n}$$

where, C is the closing price of each of n timeframes (where 1 timeframe is less than 1 hour) and n is the total number of timeframes.

Exponential Moving Averages (EMA): EMA is another form of moving average. Unlike the SMA, it places a greater weight on recent data points, making data more responsive to new information while also filtering out noise, thus providing better information on trend. When used with other indicators, EMAs can help traders confirm significant market moves and gauge their legitimacy. It is a lagging indicator.

$$EMA_{current} = \left(C_{current} * \left(\frac{S}{1 + n} \right) \right) + EMA_{previous} * \left(1 - \left(\frac{S}{1 + n} \right) \right)$$

where, n is the total number of candles to be considered, $EMA_{previous}$ is the EMA for the previous candle, $C_{current}$ is the closing price of the current candle and S is the smoothing coefficient, usually taken equal to 2.

Moving Average Convergence Divergence (MACD): MACD is an indicator that detects changes in momentum by comparing two EMAs. It can help traders identify possible buy and sell opportunities around supply and demand levels. ‘Convergence’ means that two moving averages are coming together, while ‘divergence’ means that they’re moving away from each other. If the EMAs are converging, it means momentum is decreasing, whereas if the EMAs are diverging, momentum is increasing. It is a lagging indicator. Its formula is as follows:

$$MACD = 12\text{-period EMA} - 26\text{-period EMA}$$

Signal = 9-period EMA of MACD values

The signal line is used with MACD to identify trends using historic data. A histogram of the difference of both MACD and Signal line is also used.

Relative Strength Index (RSI): RSI is mostly used to help traders identify momentum, market conditions and warning signals for dangerous price movements. It was introduced in 1978 by technical analyst J. Welles Wilder Jr. in his book *New Concepts in Technical Trading Systems*. RSI is expressed as a figure between 0 and 100. An asset around the 70 level is often considered overbought, while an asset at or near 30 is often considered oversold. An overbought signal suggests that short-term gains may be reaching a point of maturity and assets may be in for a price correction. In contrast, an oversold signal could mean that short-term declines are reaching maturity and assets may be in for a rally. It is a leading indicator. Its formula is as follows:

$$RSI_{step\ one} = 100 - \left[\frac{100}{1 + \frac{Average\ Gain}{Average\ Loss}} \right]$$

The average gain or loss used in the calculation is the average percentage gain or loss during a look-back period. The formula uses a positive value for the average loss. Periods with price losses are counted as 0 in the calculations of average gain, and periods when the price increases are counted as 0 for the calculation of average losses. The standard is to use 14 periods to calculate the initial RSI value.

Once there are 14 periods of data available, the second part of the RSI formula can be calculated. The second step of the calculation smooths the results.

$$RSI_{step\ two} = 100 - \left[\frac{100}{1 + \frac{(Previous\ Average\ Gain * 13) + Current\ Gain}{(Previous\ Average\ Loss * 13) + Current\ Loss}} \right]$$

Volatility Oscillator (VO): Volatility Indicators help in gauging the periods of high and low volatility in the particular stocks or market as a whole.

The big swings created by the volatility can provide good trading opportunities to the traders

In order to know the periods of high and low volatility in the market, traders can use volatility indicators which will help them in analysing these periods.

There are certain widely used volatility indicators that help the traders to know when the volatility is high or low in the stock .

A volatility based momentum oscillator (VBMO) is calculated using a short-term moving average, the distance of price from this moving average, and the trading instrument's historical volatility. Even though VBMO's calculation is relatively simple, the resulting values can help traders identify, analyse and act upon many scenarios, such as climax tops, reversals, and capitulation. Moreover, since the units and scale for VBMO are always the same, the indicator can be used in a consistent manner across multiple timeframes and instruments.

USING THE TOOLS

To develop a trading algorithm, a combination of one or more signal generators is used, along with one or more confirmatory indicators. For signal generating indicators, the indicators that provide predictions in price or momentum are used. For confirmatory signals, lagging indicators which provide insight into current trends are used. The model herein utilizes a MACD, two RSIs of different periods and two MAs of different periods are used for generating a buy or sell signal. For confirmatory indicators, two EMAs and a simple *volatility oscillator* is used. All of these were calculated in Python using standard libraries.

Their Use

Each indicator here has a purpose which is as follows:

1. Signal Generating Indicators:

1.1 MACD: The MACD used here is a fast MACD, generating its values using a 21-period and 8-period EMA. The signal line is calculated using a 5-period EMA of the MACD. These values are used when a faster MACD (less lagging) is required. Here, we need a fast MACD as we need to identify changes in trend as soon as they occur, even when they are small. Therefore, a MACD which uses the 8, 21, 5 values instead of the standard 12, 26, 9 is known as the *fast MACD*.

When the MACD line crosses above the signal line, we get a positive crossover or a “bullish signal”. When the MACD line crosses below the signal line, we get a negative crossover or a “bearish signal”. We will use bullish signals for buying orders and bearish signals for selling orders.

1.2 RSI: In this system, two RSIs are used, a 5-period RSI and a 13-period RSI. The purpose of RSI is to predict and understand momentum of price of an asset and evaluate its overbought or oversold conditions by measuring the magnitude of recent price change. Here, it is used to identify trend strength, trend reversal as well as a level at which a price value is maintained. The purpose of using two RSIs of different timeframes is to identify all of aforementioned attributes on a standard scale as well as a shorter scale or a *faster* scale

When this function is called, values 13 and 5 are passed in argument of RSI in place of period. When an RSI has a value greater than 50, it is considered a bullish signal. When an RSI has a value less than 50, it is considered a bearish signal.

1.3 MA & EMA: In combination to the above three indicators, three SMAs and one EMA are also used. The purpose of these is to use historical data of the asset and define the underlying trend. Using multiple MAs and EMAs and their crossover, we can calculate change in trend. Here, two of the SMAs are used together, while the third SMA is used with the EMA. The two SMAs used together are 5-period SMA and 11-period SMA, while the SMA used with the EMA is a 36-period SMA. The EMA used is a 13-period EMA. Crossover of both SMA-SMA and EMA-SMA define the same thing: change in short-term vs change in long-term.

If the value of Crossover1 is 1, then we have a bullish signal. If the value of Crossover1 is -1, then we have bearish signal. If the value is 0, then previous value is considered. Same goes for Crossover2. If the value of Crossover2 is 1, then we have a bullish signal. If the value of Crossover2 is -1, then we have bearish signal. If the value is 0, then previous value is considered.

Confirmatory Indicators

2.1 EMA: For confirming whether a buy or sell signal is following the longer-term trend, two EMAs are used in combination and the difference in their values can determine the trend as well as the change in trend. The two EMAs used are 50-period EMA and 200-period EMA. Their crossovers are called 'Golden Cross' and 'Death Cross'. When the 50-period EMA crosses above the 200-period EMA, we get a golden cross. When the 200-period EMA crosses over the 50-period EMA, we get a death cross.

If the value of Market Trend is 1, the market is favorable for buy orders. If the value is -1, the market is favorable for sell order. If the value is 0, the previous value is considered.

2.2 Volatility Oscillator: It is a simple indicator used to quantify changes in price, or its volatility. It consists of a spike value (when plotted called the spike line) which oscillates roughly between two bands, the Upper Band and Lower band, both of which are standard deviations of the spike line. If the spike line crosses above the Upper band, then the market is favorable for buy orders. If the spike line crosses below the lower band, then the market is favorable for sell orders. It is used as profits can only be generated when there is sufficient movement in price. If price stays at the same level, no profits can be made.

The Algorithm

Step 1 – Calculate all values of the signal generating indicators for each candlestick's closing price. Determine whether they are bullish or bearish.

Step 2 – If all signal generating indicators are bullish at the same time, then a potential buy signal alert is generated. If all signal generating indicators are bearish at the same time, then a potential sell signal alert is generated. As soon as the candlestick closes, the potential buy or sell signal is confirmed. If not, then repeat step 1.

Step 3 – When a buy or sell signal is generated, check whether market is bull or bear. For buy signals to be confirmed, the 50-period EMA should be above the 200-period EMA. For sell signals to be confirmed, the 200-period EMA should be above the 50-period EMA. If the signal is not confirmed by the EMAs, repeat step 1.

Step 4 – If a signal is confirmed by the confirmatory EMAs, use volatility oscillator to confirm if there is enough volatility in the market. To confirm a buy signal, the spike line should be above the upper band. To confirm a sell signal, the spike line should be below the lower band. If the signal is not confirmed by the volatility oscillator, repeat step 1.

Step 5 – If the signal is confirmed by all the confirmatory indicators, open a buy or sell position at the opening price of the next candlestick.

Step 6 – If the price has moved in our favor, close the position if we had placed a buy order and any of the signal generating indicators gives a bearish signal. For sell orders, Close the position if any of the indicators gives a bullish signal.

Implementation of Algorithm

The algorithm was applied to various assets and tested on historical data without any bias. The selected timeframe was 10 minutes and the initial fund size was \$1000. Following are the results of implementation of the strategy when applied to Ethereum (cryptocurrency) with My strategy VS the SuperTrend.

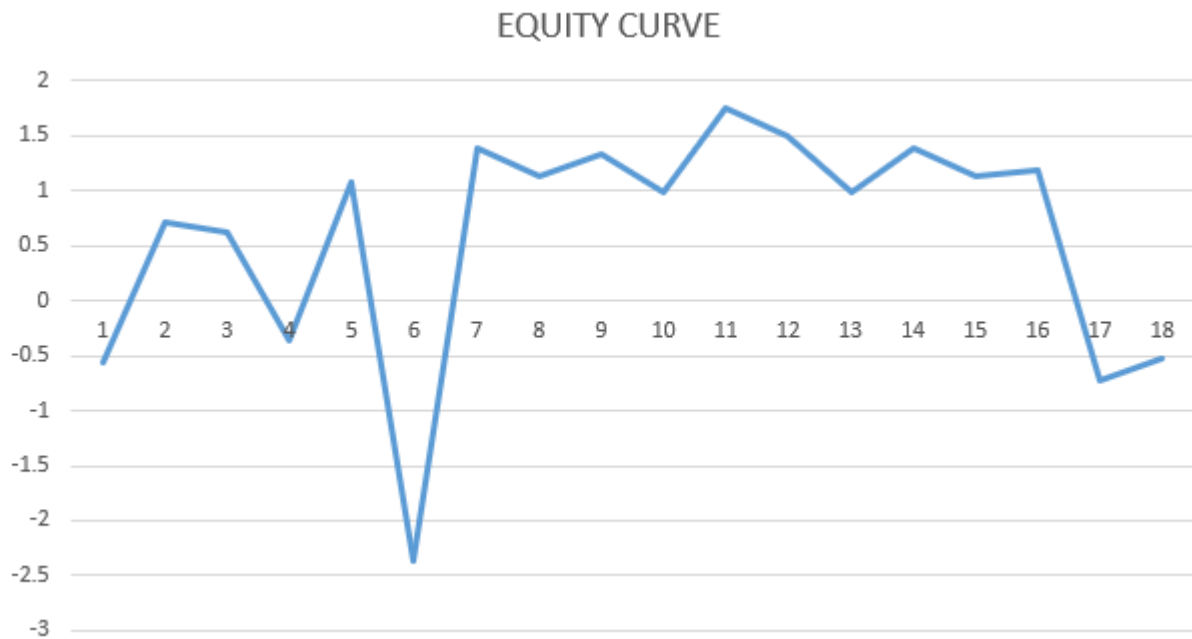
Super Trend is a trend following indicator similar to moving averages. It is plotted on price and the current trend can simply be determined by its placement vis-a-vis price. It is a very simple indicator and is constructed with the help of just two parameters- period and multiplier. When we construct the Supertrend indicator strategy, the default parameters are 10 for Average True Range (ATR) and 3 for its multiplier. The average true range (ATR) plays a key role in 'Supertrend' as the indicator uses ATR to compute its value.

ETHERIUM(CryptoCurrency):

MY STRATEGY:

1	Entry Price	Mark Price	Type of Trade (1 for Selling, 2 for buying)	Change Percentage	Fund Size	PnL per Trade	Profits	Losses
2					1000	0	0	0
3	1945.2	1946.3	1	-0.000565495	999.4345054	-0.565494551	0	-0.56549
4	1945.8	1947.2	2	0.000719498	1000.153597	0.719091534	0.719092	-0.56549
5	1945.8	1944.6	1	0.000616713	1000.770405	0.616807645	1.335899	-0.56549
6	1947.1	1947.8	1	-0.000359509	1000.410619	-0.359785981	1.335899	-0.92528
7	1946.6	1948.7	2	0.001078804	1001.489866	1.079247046	2.415146	-0.92528
8	1948.2	1952.8	1	-0.002361154	999.125194	-2.364671688	2.415146	-3.28995
9	1951.3	1948.6	1	0.001383693	1000.507676	1.38248246	3.797629	-3.28995
10	1948.7	1946.5	1	0.001128958	1001.637207	1.129530912	4.92716	-3.28995
11	1945.9	1943.3	1	0.001336143	1002.975538	1.338330202	6.26549	-3.28995
12	1944.5	1942.6	1	0.000977115	1003.95556	0.980022382	7.245512	-3.28995
13	1941.2	1944.6	2	0.001751494	1005.713982	1.758422061	9.003934	-3.28995
14	1943.3	1946.2	2	0.001492307	1007.214816	1.500833915	10.50477	-3.28995
15	1944.8	1946.7	2	0.000976964	1008.198829	0.984012829	11.48878	-3.28995
16	1947.7	1950.4	2	0.00138625	1009.596445	1.397616079	12.8864	-3.28995
17	1950.2	1952.4	2	0.001128089	1010.73536	1.138915075	14.02531	-3.28995
18	1952.1	1954.4	2	0.001178218	1011.926227	1.190866927	15.21618	-3.28995
19	1953.2	1954.6	1	-0.000716772	1011.200906	-0.725320867	15.21618	-4.01527
20	1951.9	1952.9	1	-0.000512321	1010.682846	-0.518059791	15.21618	-4.53333

EQUITY CURVE



WINRATE \approx 75%

TOTAL PROFITS = +134.0147

TOTAL LOSSES = -48.2851

TOTAL CHANGE % = 10.68284619%

Comparison to Other Strategies

To confirm the accuracy of the model herein, it must be tested and compared to other popular strategies used by traders all around the world. One such strategy involves the use of an indicator called the SuperTrend Indicator and a 200-period EMA. With more than 40 thousand likes, this indicator is one of the most popular indicator on TradingView, a free-for-all charting platform.

A Super Trend is a trend following indicator similar to moving averages. It is plotted on price and the current trend can simply be determined by its placement vis-a-vis price. It is a very simple indicator and is constructed with the help of just two parameters- period and multiplier.

When we construct the Supertrend indicator strategy, the default parameters are 10 for Average True Range (ATR) and 3 for its multiplier. The average true range (ATR) plays a key role in 'Supertrend' as the indicator uses ATR to compute its value.

HOW TO USE IT:

For using this indicator, you need to open the chart of a particular stock that you want to track and set a time interval of 10 minutes when doing intraday trading.

You can use any good charting software. After opening the chart insert supertrend and keep the settings as 10 and 3.

You can also insert your own settings as well.

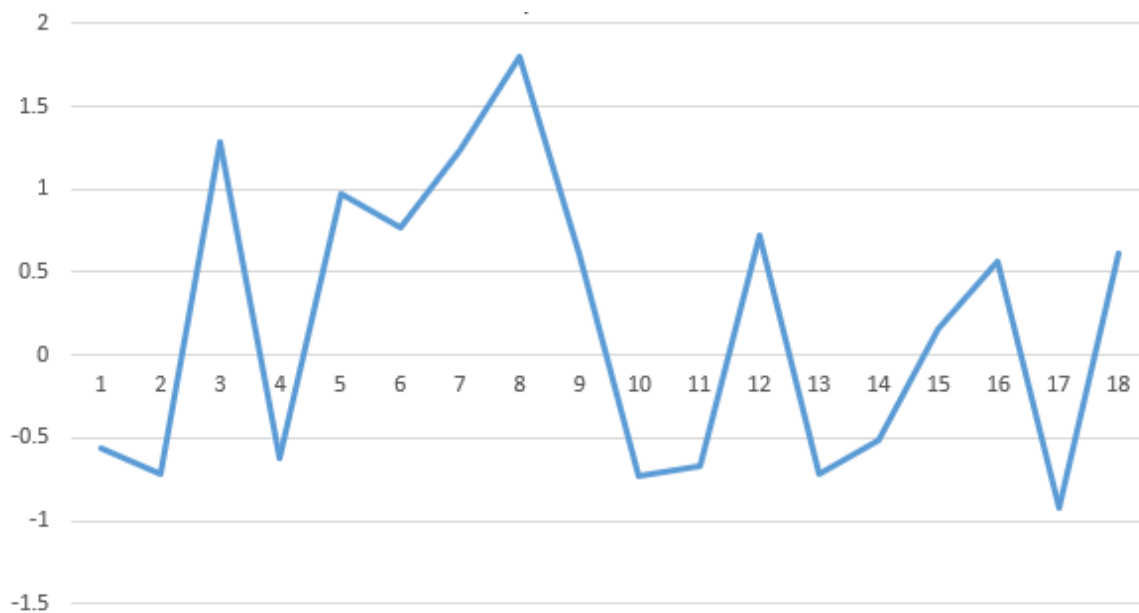
However, while you using this indicator, you should not avoid putting your stop loss.

Implementation

The algorithm was applied to various assets and tested on historical data without any bias. The selected timeframe was 15 minutes and the initial fund size was \$1000. Following are the results of implementation of the SuperTrend on Ethereum :

	A	B	C	D	E	F	G	H
1	Entry Price	Mark Price	Type of Trade (1 for Selling, 2 for buying)	Change Percentage	Fund Size	PnL per Trade	Profits	Losses
2					1000	0	0	0
3	1945.2	1946.3	1	-0.000565495	999.4345054	-0.565494551	0	-0.56549
4	1945.8	1947.2	1	-0.000719498	998.7154139	-0.719091534	0	-1.28459
5	1947.1	1944.6	1	0.001283961	999.9977253	1.282311404	1.282311	-1.28459
6	1946.6	1947.8	1	-0.000616459	999.3812673	-0.616458066	1.282311	-1.90104
7	1948.2	1950.1	2	0.000975259	1000.355923	0.974655789	2.256967	-1.90104
8	1951.3	1952.8	2	0.000768718	1001.124915	0.768991895	3.025959	-1.90104
9	1948.7	1946.3	1	0.00123159	1002.357891	1.232975725	4.258935	-1.90104
10	1945.9	1942.4	1	0.001798654	1004.160785	1.802894608	6.061829	-1.90104
11	1944.5	1943.3	1	0.000617125	1004.780478	0.619692951	6.681522	-1.90104
12	1941.2	1942.6	1	-0.000721203	1004.055827	-0.724651076	6.681522	-2.6257
13	1943.3	1944.6	1	-0.000668965	1003.384149	-0.671678369	6.681522	-3.29737
14	1944.8	1946.2	2	0.000719868	1004.106453	0.722304509	7.403827	-3.29737
15	1947.7	1949.1	1	-0.000718797	1003.384705	-0.721748234	7.403827	-4.01912
16	1950.2	1951.2	1	-0.000512768	1002.870202	-0.514503489	7.403827	-4.53363
17	1952.1	1952.4	2	0.000153681	1003.024323	0.154121746	7.557949	-4.53363
18	1953.2	1952.1	1	0.000563178	1003.589205	0.564881607	8.12283	-4.53363
19	1952.8	1954.6	1	-0.000921753	1002.664143	-0.925061742	8.12283	-5.45869
20	1954.1	1952.9	1	0.000614093	1003.279873	0.615729477	8.73856	-5.45869
21								
22								
23								

EQUITY CURVE

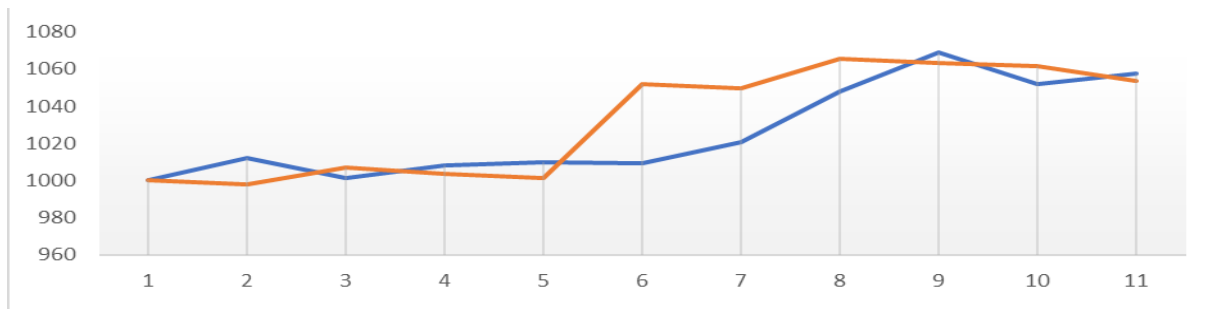


WINRATE=60%

TOTAL PROFIT= 92.96653

TOTAL LOSSES= -52.2987

TOTAL CHANGE % = 3.27987265%



BLUE LINE-PROJECT LINE

ORANGE LINE = SUPERTREND LINE

ADVANTAGES AND DISADVANTAGES

Advantages:

- Extremely precise and accurate. Can make good amounts of profit in a short window of time.
- Does not give a lot of signals. Doing a lot of trades (more than 25 a day) can result in traders having to pay a lot of transaction/exchange/service fee, which when accounted for in the long run, becomes a giant number.
- Does not wait for trend reversals to achieve profit. The strategy 'rides the trend wave' to generate profit. Going with the trend also minimises losses as there is a lower probability of the price to fall through the loss region.
- Easy to implement and interpret. Using Python to calculate all the values, we can automate the program to return values which can be converted to bullish or bearish (for example, return 1 for bullish when the RSI is above 50 and -1 for bearish when it is below 50). Hence, we can easily check if a signal is valid or not.

Disadvantages:

- It may miss massive rallies in the opposite direction as this strategy does not work for trend reversals.
- It may give false signals including false confirmations due to sudden price changes. Sudden price changes are highly prone to corrections. Market manipulation by large entities such as banks, whales etc. can cause sudden price changes.
- Sometimes the number of valid signals might be too low. As compared to other strategies, our model gives lesser investment opportunities. Even though it is much safer, the lack of opportunities might not sit well with everyone.
- The implementation of the Volatility Oscillator in Python is difficult as the indicator is the property of TradingView and can only be used through expensive APIs.

CONCLUSION & FUTURE SCOPE

In conclusion, this project aimed to create a trading model using mathematical functions in Python and was successful. The model created is very precise and accurate and proves to be better by generating more profits than other popular indicators/strategies that are available on TradingView using the historical data of Bitcoin, TSLA and GBPJPY.

The precision and accuracy of this model can only be increased via finding better values for all the calculations. All current values have been set by trial-and-error and thorough testing. Using Python, a lot of the tasks have been automated and all the user has to do is to check and confirm signals and manually place orders. In the future, order placement can be automated as well and the model will become a trading bot, a tool used by many. However, trading bots are expensive and small investors are unable to afford them. Using this model, an inexpensive trading bot can be created to be used by all.

The immediate course of action for this model is to create an interface so that an average trader can use it easily. Currently, one has to run the Python code and understand all the outputs to come to a conclusion, which might prove difficult for non-coders. Using an interface, being a coder becomes irrelevant as one has to only look at a message on the screen which will indicate whether the user has to open a buy position or sell position. Currently, this is not possible as this can be done only through APIs which are priced at exorbitant amounts.

Currently, a Python program which can provide signals in real-time has not been created. All the testing was done on historical data as real-time data streaming runs into the same problem as above: it requires the use of high priced APIs. There are alternate APIs, however they do not provide with real-time data. These APIs allow us to directly get the latest historical data into Python, which we used in our testing.

Therefore, we can see that there is a lot of potential in this model and going forward, we might get to discover better values for computation and better indicators which might be added to the existing model or get replaced with the existing indicators in the model, along with the creation of an interface.