



Optimizing Trading Strategies By Bollinger Bands And RSI Approaches For Stock Forecasting

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Abstract: Technical study, which practices historical values to find indicators that highlight potential movements in stock prices, is especially relevant to the application of time series analysis and estimating to the stock market. This study investigates the use of the Relative Strength Index (RSI) and Bollinger Bands as technical indicators to produce buy and sell signals for stock trading. While RSI provides a gauge of a stock's overbought or oversold conditions, Bollinger Bands offer information about a stock's volatility and possible reversal points. The resolution of the study is to assess how well these indicators work together when making decisions about when to enter and exit the stock market. Bollinger Bands are computed using standard deviations from the moving average to determine possible breakout or breakdown levels. At the same time, RSI is used to estimate the momentum of the stock as well as possible trend reversal points. By combining the two indicators, a trading strategy is created that will produce buy signals when certain criteria are met. The study employs historical stock price data to evaluate the strategy's resilience and flexibility by applying it to a range of stocks and time periods. Performance metrics are used to assess the efficacy of the suggested strategy, such as accuracy, return on investment, and risk management. The potential of using RSI and Bollinger Bands as complimentary tools to improve trading decisions is demonstrated by the results. The results add to the corpus of knowledge on technical analysis and provide traders and investors with useful information for optimising their strategies in volatile markets.

Index Terms -Bollinger Bands, Relative Strength Index, Technical Analysis, Stock Trading, Buy-Sell Signals, Volatility, Momentum.

I. INTRODUCTION

The search for effective tools and strategies to predict stock price movements has led to the widespread use of technical analysis in the fast-paced and unpredictable world of financial markets. This journal delves into stock prediction through the lens of technical indicators, unravelling the complexities of these tools and their role in deciphering market dynamics. Technical analysis is constructed on the knowledge that historical price and volume data can forecast future price movements. Fundamental study investigates a company's fiscal healthiness and intrinsic value, whereas technical study studies price charts and patterns. This journal focuses on unravelling the collective impact of technical indicators on stock prediction.

Investors and traders constantly seek sophisticated strategies to navigate the complexities of stock price movements in the volatile world of financial markets. Technical analysis has emerged as a cornerstone among the plethora of tools available, providing insights into potential trends and reversals. This journal delves into the Bollinger Bands and Relative Strength Index (RSI) strategy, a compelling combination that capitalises on the strengths of these two well-known technical indicators.

Bollinger Bands adapt to market conditions, expanding and contracting with fluctuations in volatility. They are composed of a mid band - a moving average - flanked by upper band and lower bands representing standard deviations. The scale and speed of price movements are measured by RSI, allowing dealers to find overbought or oversold conditions. The RSI scale is 0 to 100. If it reaches above 70 indicating possible overbought conditions and if it reaches below 30 indicating possible oversold conditions.

A dynamic strategy is grounded on the union of these two indicators. By combining Bollinger Bands' insights into volatility and potential reversal points with RSI's momentum analysis, dealers can gain a more complete kind of current market sentiment and forecast future price movements.

II. Related Work

Stock Technical Indicators(STI) are one of the statistical calculations constructed on the price, volume of the stock, or significance for a share. These does not subject to on basics of a business, such as earnings, revenue, or profit or loss margins. To exhibit the predictability of daily stock price Manish Agarwal et al[1] presented a correlation-Tensor with stock Trend Indicators for better and accurate prediction. The mean prediction accuracy obtained by proposed model is 59.25% which is greater than bench mark approaches. In[2], researcher used two models CNN model is used for catching semantic from texts and RNN is used for catching context information and compared temporal properties for stock market forecasting. In this method financial news plays major role in stabilizing the results. According to Xinjie Di[3], concerned Tree algorithm is applied to feature selection and explore different ways of validation. The researcher explore the experiment with 70% accuracy on 3-10 day average price trend. In[4], author proposed EDLM model to identify stock trend price by using STIs. The author explore the idea of Correlation-Tensor with the popular banking sector. EDLM has given important than other state of the art algorithm. Integrating Technical Indicator and CNN is developed and implemented by Kumar Chandar[7]. There are ten Technical Indicators are used and feature vector are selected .It is converted into image using Gramian Angular field and given as input to the CNN. The model is evaluated by F1 score. The results achieves high prediction than other model. In [8] author proposed Deep Learning Model using event embedding and Technical Indicators on stock market prediction. The author used two type of inputs as numeric historical price information and textual news information. In order to improve performance Kittisak Prachyachuwong[9] created a Deep learning model to forecast the Thailand stock exchange . He used Thai economic news headlines. The headlines are divided into industry specific indexes to replicate measure of stocks .The author used LSTM & BERT architecture for this study. In [10] author used two different model .One for future trend prediction and next one for taking buy-sell decision at the end of the day. The author used LSTM model is combined with technical indicator.

Our work proposes to optimise the technical indicator for stock selection by taking the stock properties into consideration, in contrast to previous efforts that concentrate on either the handcrafted indicator or the learning method to create new indicator. In order to learn the stock representation and to appropriately rescale the indicator in light of it, we introduce important external data.

III.METHODOLOGY

In this work, we use a TATACOFFEE dataset & ITC data set with the duration 2019-2023. Finally we have 999 rows of data. Table 1 & 2 shows sample data of ITC,TATACOFFEE data set. It consist of seven important attributes. It contributes for successful findings. Table 3. Shows Sector and high volume of trade.

Table 1. ITC Sample data

Date	Open	High	Low	Close	Adj Close	Volume
26-12-2019	238.9	239.4	236.35	236.8	200.0162	14460325
27-12-2019	237.5	238.45	236.45	236.9	200.1007	8712539
30-12-2019	238	240.9	237.5	238.2	201.1987	13173134
31-12-2019	238.55	238.95	237.4	237.7	200.7764	7142051

Table 2. TATACOFFEE Sample data

Date	Open	High	Low	Close	Adj Close	Volume
26-12-2019	91.7	92.4	91.55	91.75	87.37885	151209
27-12-2019	91.9	92.3	91.2	91.85	87.47408	194738
30-12-2019	92.3	92.45	91.05	92.05	87.66456	247880
31-12-2019	92	94.25	91.2	92.1	87.71217	746744

Table 3. Symbols, Setors and percentage of the high volume of stock

Symbol	Name	Sector	% high volume
ITC	ITC	Consumer/Beverage	38
TATACOFFEE	TATACOFFEE	Consumer/Beverage	14.64

A. Bollinger Band

Bollinger Bands are price envelopes invented by John Bollinger. They are plotted in a new window. Price envelopes known as Bollinger Bands are plotted above and below the price's simple moving average at a standard deviation level. The bands' distance is determined by standard deviation, which allows them to adapt to fluctuations in the underlying price's volatility. Period and standard deviation are the two parameters of Bollinger Band. Their default values are 20 and 2 respectively. This band can help to determine if the cost of the stock is high or low. The band consists of upper and lower bands along with a moving average.

Working principle

When the bands stiffen through a period of small volatility, the probability of a high-pitched price move in either direction rises. This could be the start of a trend. When it separates by a remarkably big amount, volatility rises and any current trend may come to an end. Prices have a tendency to bound within the covers of the bands, touching one band then moving to the other. These swings can be used to help you identify potential profit targets. During strong trends, price can exceed or hug a band envelope for extended periods of time. When the price breaks out of the bands, a strong trend continuation is likely. However, if prices immediately return to within the band, the suggested strength is negated. Fig.1 shows the parameters of Bollinger Band. Based on a 20-day simple moving average, here's the formula for calculating Bollinger Bands (at two standard deviations):

$$\text{Upper band} = 20\text{day SMA} + (20\text{-day SD} * 2)$$

$$\text{Middle band} = 20\text{day SMA}$$

$$\text{Lower band} = 20\text{day SMA} - (20\text{day SD} * 2)$$

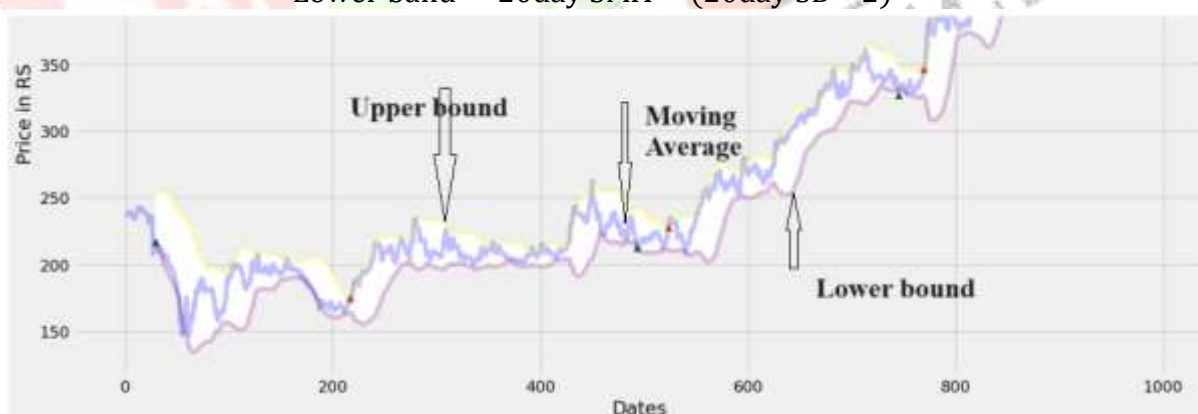


Fig.1 Example of Bollinger Band in the trends

B. RSI(Relative Strength Index)

Plotted beneath the price graph of an asset, the RSI gives technical traders signals about bullish and bearish price momentum. When the RSI is over 70, an asset is generally regarded as overbought, and when it is below 30, it is deemed oversold. Rather than curving markets, the RSI performs best in trading choices. RSI is a tool that traders can use to forecast a security's price behaviour. Traders can use it to verify trends and trend reversals. It may indicate securities that are overbought or oversold. It can offer buy and sell signals to traders who trade in the short term. It's a technical indicator that can help trading strategies when combined with other indicators. The relative strength index, as a momentum indicator, contrasts the strength of a security on days when prices rise with its strength on days when prices fall. Traders can get a sense of how a security might perform by comparing the outcome of this comparison to price movement.

Working principle

The formula below serves as the foundation for the two-part calculation used by the RSI:

$$RSI_{step\ one} = 100 - \left[\frac{100}{1 + \frac{Average\ gain}{Average\ loss}} \right] \quad ..(1)$$

$$RSI_{step\ two} = 100 - \left[\frac{100}{1 + \frac{(Previous\ Average\ Gain * 13) + Current\ gain}{(Previous\ Average\ loss * 13) + Current\ loss}} \right] \quad ..(2)$$

The RSI can be plotted beneath the price chart of an asset once it has been calculated, as demonstrated below. The more and larger the number of up days, the higher the RSI will be. As the amount and magnitude of down days rise, it will decrease. Fig. 2 shows RSI Indicator to indicate Overbought and Oversold of the stock.



Fig.2 Example of RSI in the trends

IV. RESULTS AND DISCUSSION

The dataset used in this research consists of historical stock price data for multiple assets traded on the NSE from 26-12-2019 to 26-12-2023. The data is sourced from reputable financial data providers, ensuring accuracy and reliability. Financial institutions, stock brokers, and large-scale investors must sell and buy the shares in the shortest time feasible under the law. By effectively capturing the nonlinear behaviour of complex systems, recent breakthroughs in Machine Learning approaches have created valuable tools for anticipating chaotic circumstances such as the stock market. In fig 3 & 4 shows Buy and Sell signals in various time period with the help of Bollinger band RSI indicator.



Fig.3.Bollinger Band & RSI trading Strategy of ITC



Fig.4.Bollinger Band & RSI trading Strategy of TATACOFFEE

Table 4. Accuracy and signals of stock

Symbol	Accuracy	Buy Signal	Sell Signal
ITC	98.29%	4(various time period)	4(various time period)
TATACOFFEE	97.48%	6(various time period)	6(various time period)

Table 5. Evaluation Metrics of stock

Symbol	ERROR(RMSE)	ERROR(MAPE)
ITC	17.3240	5.1042
TATACOFFEE	19.5540	6.2076

Table 4. shows Accuracy of stock , buy and sell signals also. In various time span it produces buy or sell signals. Table 5. Shows evaluation metrics by RMSE and MAPE Error calculation.

V. Conclusion

The study shows how well Bollinger Bands work at predicting stock price volatility and possible reversal points. Utilising standard deviations surrounding the moving average offers a dynamic method of evaluating price fluctuations. Indicating overbought or oversold market conditions and providing information about potential trend reversals and momentum shifts, the Relative Strength Index (RSI) is useful. The buy and sell signals in a comprehensive trading strategy are more robust when Bollinger Bands and RSI are combined. Despite their differences, the two indicators work well together to provide a more complex picture of market dynamics.

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