

A Comparative Study on Effectiveness of Volume Based RSI vs. Traditional RSI

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Abstract: Relative Strength Index (RSI) is a simple, very frequently used technical tool to identify overbought and oversold stocks. The objective of this paper is to conduct empirical analysis of traditional RSI Vs. volume based RSI on a set of most frequently traded stocks traded in National Stock Exchange. The current study tries to explain the effect of volume on stock price. In day trading it is believed that on any day if there is increased volume trading on ask side of a stock, it means there is a greater demand for that stock as the demand side is higher than the supply side. Changes in stock volume signify that there is some information related to the stock, either positive information or negative information which created a euphoria in the minds of traders. The current day trading strategy can be considered as the hybrid strategy which takes into consideration both the volume and RSI.

Key Words: Financial forecasting, NIFTY, RSI, Technical analysis tool, Volume based RSI.

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I. Introduction:

The Relative Strength Index (RSI) acts as an effective technical indicator which measures the momentum of recent price changes. RSI indicates overbought or oversold position for a stock or an asset. It is also known as the oscillator and its value ranges from 0 to 100. RSI was invented by J. Weller Wilder Jr. in his book entitled "New concepts in Technical Trading Systems". The current study introduces volume based RSI which takes into consideration the trading volume.

Problem Statement: Technical analysis involves making short term buy or sell decisions by considering the historical prices of the stock and also forecasting the future price movements based on historical prices collected. The assumption behind technical analysis is "History repeats" i.e., the future stock prices are guided by the past price movements. Therefore it is important to note that previous stock prices are required to forecast their future evolution.

Technical analysis has been the popular tool which was widely used in the stock market and till today it has not lost its significance. But then also technical analysis has its own drawbacks.

Objectives of the study:

- To study the functioning of classic RSI
- To reconfigure the index by taking account of the trading volume in its calculation formula
- To compare the results obtained from classic RSI with adjusted RSI

Statement of Hypothesis:

In a view to achieve the aim and objectives stated for the study, the following Hypothesis can be formulated:

H₀-There is no significant difference in the gains from classic RSI and volume adjusted RSI

II. Literature Review:

There are a plethora of research conducted on Technical oscillators such as RSI, MACD and Bollinger bands. Some of the significant ones are mentioned below:

(Terence Tai-Leung Chong, 2014) Examined two most frequently used technical indicators namely Moving Average Convergence and Divergence (MACD) and Relative Strength Index (RSI) as a measure of profitability. From the study it was concluded that although both the indicators give a higher profits, MACD

was found to more efficient and strong signal which is also in compliance with efficient market hypothesis (EMH).

(Shah Nisarg Pinakin, June, 2015) In their study have made a comparative analysis of Bollinger Bands with Relative Strength Index. The authors selected the closing prices of a set of stocks from Auto, IT and oil industry for one year. Out of analysis it was concluded by the authors that Bollinger bands gave a higher returns compared to RSI.

(Dr. Bhargavi. R, 2017) In this study the authors make a comparative analysis of P/E ratio with EPS. For the study 20 scripts were chosen out of which 10 scripts were chosen with highest P/E ratio and another 10 scripts with highest EPS were chosen. After analysis using RSI it was found that P/E ratio was a better indicator of profitability than EPS.

(Choudhuri, July 2019) In another significant study conducted by Sajjan Choudhuri a comparative analysis of buy and hold strategy was done against the RSI strategy. The author compared the profits derived from buy and hold strategy with RSI signal on 30 stocks which are the components of SENSEX. From this study it was found that the signals given by RSI are very strong compared to buy and hold strategy.

(Alhilfi, January 2019) This study was with related to investment pattern of Iraqi Stock Exchange. The author tried to study the investors preference towards stocks and what are the tools used by investors in order to predict the sentiments of the market. The author found that speculators who invested in Bank of Baghdad were better able to predict the prices of stock using RSI and also they were able to forecast the price.

III. Research Methodology:

Calculation of Classic RSI:

For the present study a comparative study is done using classic form of RSI and adjusted form of RSI. RSI is used to represent the relative strength of a security's return in comparison with market return. For determining RSI, we have to determine the highest closing price (change in upward movement represented by U) or lowest closing price (the downward change represented by D) as follows:

$$U \text{ Close} = TCP - YCP \dots\dots\dots(1)$$

$$D \text{ Close} = YCP - TCP \dots\dots\dots(2)$$

Where TCP = Today's Closing Price, YCP = Yesterday's Closing Price

By looking at the above formula it can be made out that on a particular day U and D values are mutually exclusive events. Therefore if U is positive for a particular day, the value of D is taken as 0 and vice versa.

In addition to this an exponential moving average (EMA) is calculated for U and D in order to eliminate the influence of random factors which seems to be unusual for the averages. This EMA is computed using a "multiplier" called α for a specific number of days.

The number of days to be considered is 14 days as mentioned by Mr. Wilder but for EMA the author has considered 27 days for number of days in his book. The α multiplier will act as weighted average, giving higher weightage to recent stock prices and less weightage to older prices. The α multiplier is determined using the formula:

$$\alpha = \frac{2}{N+1} \dots\dots\dots(3)$$

If we consider the number of days as 27 for example, then α value will be equal to 1/14. Computation of EMA involves computation of Simple Arithmetic Average (SMA) for the data of first N days in the price under consideration. The SMA can be computed by using the formula:

$$SMA_N = \frac{X_1 + X_2 + \dots + X_N}{N} \dots\dots\dots(4)$$

Where SMA_N is the simple arithmetic average of a series of data corresponding to N number of days, X_N is the stock price corresponding to Nth day of the data set. It is important to note that while calculating RSI either $X = U$ or $X = D$.

The formula for determining exponential moving average for N+1 date is given below:

$$EMA_{N+1} = \alpha * X_{N+1} + 1 + (1 - \alpha) * SMA_N \dots\dots\dots(5)$$

Once we compute exponential moving averages of the Upper closing prices Relative strength can be calculated using the following formula:

$$RS = \frac{EMA \text{ of Upper Closing Price}}{EMA \text{ of Downward Closing Price}} \dots\dots\dots(6)$$

Finally the relative strength index is computed by using the formula

$$RSI = 100 - 100 * \frac{1}{(1+RS)} \dots\dots\dots(7)$$

The value of RSI will range from 30 to 70. An RSI value of 30 or below 30 represents the stock is oversold which shows that the stock is undervalued. An RSI score of 70 and above shows that the stock is overbought and the stock is overvalued. RSI values are interpreted differently under different market conditions. For instance if the market is highly volatile then an RSI score between 20 and 80 can be used

instead of 30 and 70. At the same time if the market is bullish the traders can rely upon buying signals and when the market is bearish it is preferred that traders should rely upon sell signals.

The divergence between the graphs can also lead to buy or sell signals which shows the evolution of RSI. When RSI graph reaches maximum which is higher than the last high price and also when RSI chart reaches below maximum which is below the previous maximum price the indicator will show a buy signal and vice versa. The buy or sell signal will be more significant if the difference between RSI chart and the data graph appears after some point of time during which the index shows oversold and overbought position.

The average level for RSI is assumed to be at 50 units. If the value of RSI exceeds 50 in upward direction from base 50 then the market is said to be bullish. And when the RSI value breaks out 50 from top to base then it is an indication of bearish trend.

The volume adjusted form of RSI:

The classic form of RSI considers only the stock price without taking into account the volume of stock traded. Volume plays a significant role while making buy and sell decisions. Hence the adjusted form of RSI takes into consideration the price of the underlying asset along with volume traded. Both the indicators put together create strong signals which are more powerful in making buy or sell decisions. Therefore in the present study two criteria have been considered to calculate adjusted RSI namely the price of the underlying asset and the volume traded. The formula to compute volume adjusted form of RSI is given below:

$$RSP_{\bar{v}} = \frac{EMA \text{ of } UP/V}{EMA \text{ DP/V}} \dots\dots\dots(8)$$

Where RSP/V is the volume adjusted Relative Strength, EMA of UP/V is the exponential moving average of the price to volume increase which happens over a period of N days, EMA DP/V is the exponential moving average of price to volume decrease which took place over a period of N years. The volume adjusted RSI which is represented as RSI_A can be calculated by using the following:

$$RSI_A = 100 * \frac{1}{(1+RS_V)} - \frac{1}{(1+RS_P)} \dots\dots\dots(9)$$

If we use the above formula the final output will be in terms of 100 which makes the buy or sell decision difficult as invented by Mr. Wilder. Therefore the above formula was adjusted to match the standard set of values proposed by Wilder.

$$RSI_A = 50 * (1 + \frac{1}{(1+RS_V)} - \frac{1}{(1+RS_P)}) \dots\dots\dots(10)$$

By applying the above formula the interpretation rule given by Mr. Wilder will not change but the signal levels will change for both buy and sell. For the RSIA value exceeding the level of 37.5 from base to upside represents increase in the price of underlying asset price while the RSIA value exceeding 62.5 from upside down indicates a bearish trend that means the underlying share price will decrease. Apart from the above changes all other interpretations made in case of classic form of RSI will remain the same.

Sources of data: For the present study the secondary data of the adjusted closing price of Nifty 50 index is collected from Yahoo Finance. The difference between closing price and adjusted closing price is that the adjusted closing price is adjusted to the market sentiments observed due to corporate actions such as Follow on public offer, stock splits and dividend issue. The time duration considered for the study includes 1st March 2016 to 1st March 2021 which includes a period of 5 years. With regard to the period under consideration it is important note that the study takes into consideration the impact of Covid 19 on the stock prices which started in India from 1st March 2020. Year 2020 has been a remarkable year in the history of India and also the World due to outbreak of Covid-19 virus. The current study examines the profitability of volume adjusted RSI with the classic form of RSI.

IV. Results and Discussion:

For the present study the empirical data was used to verify the profitability of classic form of RSI with the volume adjusted RSI. 30 & 70 are used as the standard points for classic form of RSI and 37.5 & 62.5 are used as the benchmarks for volume adjusted RSI. N is 14 days for computation of EMA value. The results are classified into two segments, the first segment consists of classic form of RSI and the second segment consists of volume adjusted form of RSI.

Results pertaining to Classic form RSI:

When the RSI closes the day on a level which is found to be above the signal or support level, then it gives a sell signal. It was assumed that the selling of one unit of NIFTY 50 will happen in the first day of trading. Simultaneously the open position will be closed as and when RSI reaches either the maximum resistance value again or a level which was found to be quite below 50 points, whichever the scenario that occurs first.

Similarly when RSI reaches the closing price at a minimum signal value which is quite lower the support level it gives a buy signal irrespective of the type of calculation used. Buying one unit of NIFTY 50 will take place on the very first day of the trading day, when RSI reaches a level which is quite above the minimum value. Again while closing the open position on the same day the RSI either reaches minimum support level or a signal level which is above 50 points.

Table 1: Computation of Classic form of RSI-Results

Classic form of RSI	Total signals	Successful Signals	Failure Signals	Gain from successful signals	Gain due to failure signals	Total Gain
Buy	94	48	46	1058.68	-1567.67	-508.99
Sell	113	55	58	745.64	-765.67	-20.03
Grand Total	207	103	104	2044.74	-2334.34	-529.02

Source: From Calculations

Table No. 1 represents the results obtained from applying classic RSI formula. It can be noticed from the above table that out of 207 signals, a relatively smaller proportion of signals that is ninety four signals have accounted for buy and majority of the proportion that is one hundred and thirteen signals accounted for sell signals which is not normally distributed. The total gain caused due to the signals is 529.02 points. 48 out of 94 buy signals were successful causing a gain of 1058.68 points. From the 113 total sell signals, 55 were successful with a gain of 745.64 points. The total gain caused due to the failed signals is 1567.67 due to 48 buy signals and 765.67 due to 58 sell signals. Overall gain was 529.02 points from classic form of RSI.

Table 2: Computation of Volume adjusted form of RSI-Results

RSI _A	Total signals	Successful signals	Failure Signals	Gain from successful signals	Gain due to failure signals	Total Gain
Buy	118	60	58	899.56	1465.67	-557.11
Sell	121	58	63	656.81	867.79	-210.98
Total	239	118	121	1556.37	2333.46	-768.09

Source: From Calculations

From Table 2 we can make out that by applying volume adjusted RSI indicator out of total two hundred and thirty nine signals one eighteen were found to be Buy signals. Only sixty signals were found to be successful and remaining fifty eight were failures. The gain from successful signals was found to be 899.56 points and the loss due to failed signals was found to be 1465.67 points. Overall there was a loss of 557.11 points from Buy signals. In case of sell signals out of one hundred and twenty one sell signals, fifty eight were found to be successful and sixty three were found to be failures. Again like in case of classic form of RSI, the number of signals are not normally distributed in volume adjusted RSI case. The total gain due to successful signals is 656.81 points and loss is 867.79 points. The total gain due to sell signals is 768.09 points. The overall gain due to volume adjusted RSI is 768.09 points.

V. Conclusion:

From the above results and discussions it is found that the gains generated under volume adjusted form of RSI is comparatively greater than the gains from classic form of RSI. From the above results it can be stated that both the forms of RSI will predict the short term continuation of the price movements in the underlying stock but they fail to predict the trend which persists for a longer duration of time. Therefore it can be concluded that Volume adjusted RSI is comparatively more profitable than the classic form.

References:

- [1]. Alhilfi, M. (January 2019). Role of using the Relative Strength Index in Making Speculation Decision in Stock Applied Research in the Iraq Stock Exchange. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 123–135.
- [2]. Choudhuri, S. (July 2019). A Research on Trading of Sensex Stocks by using RSI. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, 14-22.
- [3]. Dr. Bhargavi. R, D. S. (2017). Relative Strength Index for Developing Effective Trading Strategies in Constructing Optimal Portfolio. *International Journal of Applied Engineering Research*, 8926-8936.
- [4]. Shah Nisarg Pinakin, P. T. (June, 2015). A Comparative Study on Technical Analysis by Bollinger Band and RSI. *International Journal in Management and Social Science*, 234-251.
- [5]. Terence Tai-Leung Chong, W.-K. N.-S. (2014). Revisiting the Performance of MACD and RSI Oscillators. *Journal of Risk and Financial Management*, 1-12.