Trading Range Breakout Test on Daily Stocks of Indian Markets

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In the financial literature Efficient Market Hypothesis (EMH) has been one of the dominant topics. An implication of weak-form of efficiency / random walk is that the trading rules will not generate economic profits. The purpose of this study is to analyze results of application of trading range breakout (TRB) test on daily stock prices of Indian Markets, thus investigating its efficiency at the weak form level (Fama,1970). In this study three different strategies viz. Buy, Sell and Buy-Sell of TRB trading rule have been tested on daily stock prices on 200 stocks from Indian Stock markets over different time periods to test Weak Form of Efficient Market Hypothesis (WFEMH). The results from the TRB trading rule tests indicated that the technical trading rules do not yield statistically significant forecasting power. It means that forecasting of returns based on TRB trading rules cannot be employed to earn abnormal returns.

Keywords - Indian Stock Markets; Trading Range Breakout; Trading Rule Test; Weak Form Market Efficiency

JEL: G1; G11 AND G14

1. Introduction

Technical analysis involves the use of a wide variety of strategies on global business markets. Technical analyst's strategy exercise to overcome their power of the idea in the future through the study of past stock prices are predictable Stock prices. Additionally, technical analysts trace the ebb and flow of supply and Intraday stock charts and market demand for specialized knowledge of action. These violating the assumptions random walk theory - that market prices move independently His last movements and trends. Technical trading systems are composed of sets of trading rules that govern when it is appropriate for a trading to buy or sell their position within an asset. The simple trading strategies that are discussed in this research paper have one or two parameters that offer optimal trade timing by generating buy and sell signals.

According to Fama (1970), in an efficient market, prices "always fully reflect available information". Therefore, prices could be considered an unbiased estimate of the true value of an investment at any given moment. "If stock prices either overreact or under-react to information, then profitable trading strategies that select stocks based on their past returns will exist." TRB, also known as support and resistance or price channels, are used intensely within technical trading. The underlying concept of price channel trading strategies is that markets that move to new highs or lows suggest continued trends in the established direction. A buy signal is generated in a price channel strategy when the price pierces the resistance level. For price channels the resistance level is defined as the level of the local maximum price. A sell signal is generated, on the other hand, when the price pierces below the support level. Intuitively, the support level is the level of the local minimum price. Technical analysts use these strategies under the belief that traders are willing to sell (buy) at the peak (trough). Therefore, if the price surpasses the extremity of the local maximum (minimum) then it will signal a continuing movement to a new maximum (minimum) that is significant.

The paper is organized as follows; Section 1: Review of literature, Section 2: Data and methodology, Section 3: Analysis and findings, Section 4: Conclusions.

2. Literature Review

Early academic literature on technical analysis focused upon the profitability of simple technical trading rules such as moving averages and trading range breaks (Fama and Blume, 1966). A major portion of academic literature on technical analysis tested profitability from charting patterns, genetic programming methods, and other technical trading methods.

Brock, Lakonishok and LeBaron (1992) investigated two simple technical trading rules viz. variable moving average (VMA) trading rules and trading range breakout rule. They showed that the two simple trading rules have significant predictive power for the United States equity index returns. They defined the moving average trading rules as rules that are implemented by comparing two moving averages calculated over different time periods, one long-run period and the other short-run period. In addition, buy and sell signals are generated by the two different moving average periods. This strategy is expressed as buying (selling) when the short-period moving average rises above (falls below) the long period moving average. The trading range breakout rule generates a buy (sell) signal as the stock price penetrates new highs (lows). They considered the technical trading rule with and without one percent band width. For example, a variable moving average rule for weekly stocks for sub-period of 2.5 years is (5,50,0.01) for which the short period is 5 weeks and the long period is 50 weeks and a 1% band filter is applied, which indicates that a buy (sell) signal is only produced when the short-run moving average is at least 1% above (below) the long-run moving average. (Brock *et al*., 1992).

Trading rules tests of WFEMH based on VMA and TRB were utilized along with other tests by Thomas & Brian (2005). They carried out test for predictability in seven Middle-Eastern North African markets by investigating both the WFEMH and

the returns from technical analysis. Starting with tests for the Random Walk Hypothesis (RWH), they used daily data returns and a battery of econometric tests including unit-root analysis, individual and multiple variance ratio, wild bootstrapping and non-parametric tests based on ranks. Their results suggested that only Israel and Turkey followed a random walk. Technical analysis based on VMA and TRB trade rules constituted further evidence for stock market predictability. Finally, taking into account local trading costs, profit simulations based on the breakeven costs computation methodology established the possibility of raising abnormal positive returns in the region.

3. Data and Methodology

Data: The data comprises of daily share prices (adjusted for bonus, rights and stock splits) for 200 companies that form part of the Bombay Stock Exchange (BSE) 200 index from 1st April, 2000 to 31st March, 2010 (daily observations). The sample companies account for more than 83.6% of the market capitalization as well as the trading activity on the Indian market. The sample is hence fairly representative of the market performance.

The daily share price (day closing price) series have been converted into daily return series for further estimation. The daily data provide 2608 observations for ten year period. Subsequently, data was split in to the sub-periods of 5 years and 2.5 years as given below

Table 1 *Sub-Periods Division for Data Analysis*

Total 10Yr	First 5Yr sub-period	Second 5Yr sub-period	First 2.5Yr sub-period	Second 2.5Yr sub-period	Third 2.5Yr sub-period	Fourth 2.5Yr sub-period
Apr. 00 to Mar. 10	Apr. 00 to Mar. 05	Apr. 05 to Mar. 10	Apr. 00 to Oct. 02	Oct. 02 to Mar. 05	Apr. 05 to Oct. 07	Oct. 07 to Mar. 10

Hypothesis: Ho: 'Buy (Sell, Buy-Sell) strategy' based TRB trading rules in the Indian daily stock markets return series do not provide significantly different returns than 'buy & hold strategy'
All the null hypotheses have been tested at 95% confidence level. Null hypothesis has been rejected if P value is less than 0.05.

Statistical Tools: Initial data processing & refinement has been done using Microsoft EXCEL. The econometric tests of TRB have been applied using MATLAB software of The MathWorks, Inc. (2008).

Trading Range Breakout Test: The TRB rules generate signals by comparing the current price to the recent minimum and maximum of prices. The TRB rules generate buy signals when the current price exceeds the recent maximum by at least a pre-specified band. The rationale for this rule is that when the current price reaches the previous peak, a great deal of selling pressure arises because many people would like to sell at the peak. However, if the price exceeds the previous peak, it is indicated that the upward trend has been initiated. The purpose of using a band is to avoid the emission of 'spurious' signals. On the other hand, the TRB rules generate sell signals when the current price falls below the recent minimum by at least a pre-specified band. The rational is that when the current price reaches the previous minimum, a great deal of buying pressure arises because many people would like to buy at the minimum price. However, if the price falls below the previous minimum, it is indicated that the downward trend has been initiated. If prices remain in the intermediate range then it maintains the original position. Transaction costs were imputed to the first buy and sell signals. If traders stay out of the market then the return is null. The returns of this active trading rule are compared to a buy and hold strategy.
TRB trading rules are applied on stocks' return series wherein the following price history windows are considered based on maximum number of observations for given type of data set as illustrated.

Table 2 *Price History Window for TRB Test*

Sr. No.	Frequency of Data	Period of Data	Maximum No. of Observations	Price History Window
1	Daily	10 years	2608	200 days
2	Daily	5 years	1304	100 days
3	Daily	2.5 years	652	50 days

For application of TRB rules, recent maximums and minimums as the extreme observations over the price history window are found. If absolute value of observed statistics is greater than or equal to critical value then it indicates difference is substantial and rejects that trading rule is not able to generate significant returns than buy and hold strategy in turn rejecting WFEMH.

4. Analysis and Findings

The hypothesis Ho {'Buy (Sell, Buy-Sell) strategy' based TRB trading rules in the Indian daily stock markets return series do not provide significantly different returns than 'buy & hold strategy'.} is tested using TRB tests.

Table 3 shows the results of TRB tests for daily log returns of stocks for total ten year period for three strategies. Results of all three TRB strategies with daily return series accept the null hypothesis in turn accepting Weak Form Market Efficiency Hypothesis. It is observed that for the total period i.e. of 10 years there are no exceptions with regards to TRB test in all strategies in hypothesis acceptance.

Table 3 *Summary of TRB Test for Daily Log Returns of Individual Stocks*

P	Parameter	Buy strategy	Sell strategy	Buy-Sell strategy
April 2000 to March 2010	Acceptance %	93.33	92.31	85.64
	Hypothesis Ho	Accepted	Accepted	Accepted

Among the three strategies considered for analysis, the Buy strategy provided highest acceptance at 93.33% and Buy-Sell strategy provided lowest acceptance at 85.64% w. r. t. randomness hypothesis in case of daily data.
Table 4 shows the results of TRB Buy Strategy tests for daily log returns of stocks for all sub-periods.

Table 4 *Sub-Period Daily TRB Buy Strategy Test Results*

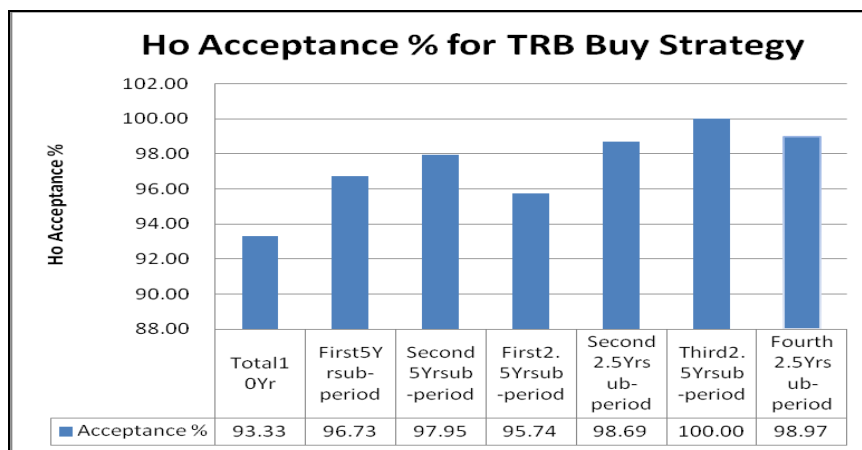| Period	Acceptance %	Hypothesis Ho
Total10Yr	**93.33**	Accepted
First5Yrsub-period	**96.73**	Accepted
Second5Yrsub-period	**97.95**	Accepted
First2.5Yrsub-period	**95.74**	Accepted
Second2.5Yrsub-period	**98.69**	Accepted
Third2.5Yrsub-period	**100.00**	Accepted
Fourth2.5Yrsub-period	**98.97**	Accepted

Figure 1 *Graphical Sub-Period Daily TRB Buy Strategy Test Results*

In case of TRB Buy strategy for all seven sub-periods the null hypothesis of weak form of market efficiency is accepted. The acceptance % is observed to be lowest in case of total 10 year period.
Table 5 shows the results of TRB Sell strategy tests for daily log returns of stocks for all sub-periods.

Table 5 *Sub-Period Daily TRB Sell Strategy Test Results*

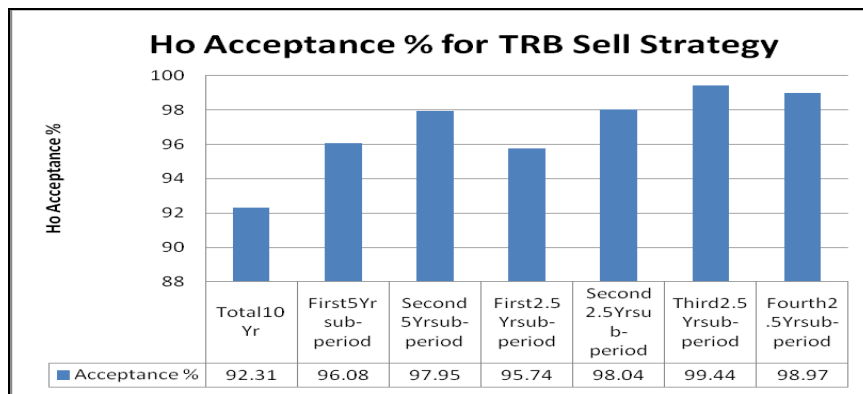| Period	Acceptance %	Hypothesis Ho
Total10Yr	92.31	Accepted
First5Yrsub-period	96.08	Accepted
Second5Yrsub-period	97.95	Accepted
First2.5Yrsub-period	95.74	Accepted
Second2.5Yrsub-period	98.04	Accepted
Third2.5Yrsub-period	99.44	Accepted
Fourth2.5Yrsub-period	98.97	Accepted

Figure 2 *Graphical Sub-Period Daily TRB Sell Strategy Test Results*

In case of TRB Sell strategy for all seven sub-periods the null hypothesis of weak form of market efficiency is accepted. The acceptance % is observed to be lowest in case of total 10 year period.

Table 6 shows the results of TRB Buy-Sell strategy tests for daily log returns of stocks for all sub-periods.

Table 6 *Sub-Period Daily TRB Buy-Sell Strategy Test Results*

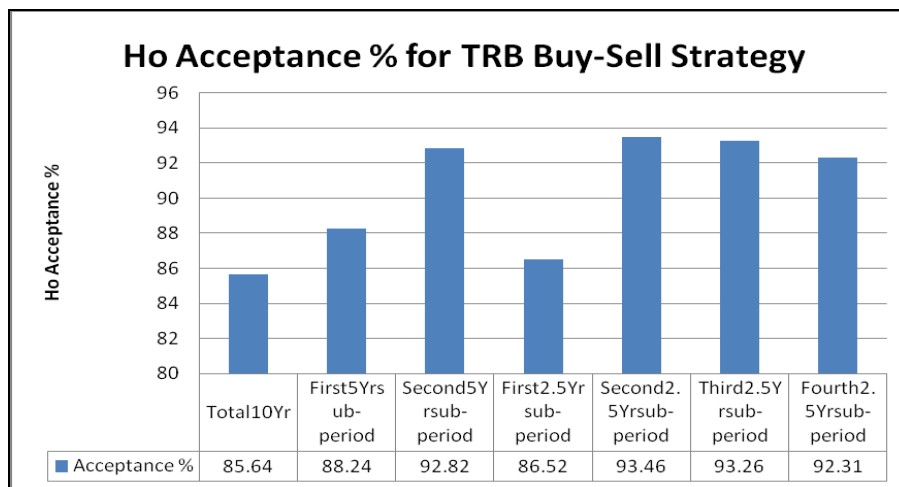| Period	Acceptance %	Hypothesis Ho
Total10Yr	85.64	Accepted
First5Yrsub-period	88.24	Accepted
Second5Yrsub-period	92.82	Accepted
First2.5Yrsub-period	86.52	Accepted
Second2.5Yrsub-period	93.46	Accepted
Third2.5Yrsub-period	93.26	Accepted
Fourth2.5Yrsub-period	92.31	Accepted

Figure 3 *Graphical Sub-Period Daily TRB Buy-Sell Strategy Test Results*

In case of TRB Buy-Sell strategy for all seven sub-periods the null hypothesis of weak form of market efficiency is accepted. The acceptance % is observed to be lowest in case of total 10 year period.

The trading rule TRB test could not reject the null hypothesis Ho indicating the return series is weak-form efficient. It means the daily log returns of stocks accept hypothesis {Random Walk No. 2 wherein $\varepsilon t \sim$ INID (independently and not identically distributed disturbance terms)} for all sub-periods. The results of TRB test with 'Buy' strategy & 'Sell' strategy exhibit lower level of predictability (i.e. more randomness) compared to 'Buy-Sell' strategy in all cases. Sub-period analysis reveals no substantial variation in the results.

The trading rule test of TRB accepts the hypothesis H_0 for all three strategies of Buy, Sell & Buy-Sell. This means trading rules in the Indian stock markets return series do not provide significantly different returns than buy & hold strategy i.e. Indian stock markets return series of stocks is weak-form efficient.

Results are contrary to earlier studies on trading rules viz. Balsara *et al*. (2007), Sundhar and Kakani (2006). The technical trading rules can be profitable to the extent to which the returns are just eliminated by the transaction costs that the trading

rules incur under the version of market efficiency which is restated by Fama (1991). The earlier studies on technical analysis (Alexander, 1964, Fama and Blume, 1966) conclude that technical analysis is not profitable when transaction costs are taken into account.

5. Conclusions

The main findings of this study indicate the non-existence of TRB trading rule profitability in the Indian stock markets. The results from the trading rule tests indicated that the technical trading rules do not yield statistically significant forecasting power. It means that forecasting of returns based on trading rules cannot be employed to earn abnormal returns.

The results indicate that none of the trading rules exhibit statistically significant forecast power and trading rules (TRB) cannot produce economically significant returns relative to the buy and hold strategy. In spite of this it is observed that the trading rules normally are found to be appealing to the investors. The explanation for the same can be that these technical rules may be generating economic returns in certain time periods and may be dependent on selected type of stock.

6. References

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