

TRADING RANGE BREAKOUT TEST ON DAILY STOCKS OF INDIAN MARKETS

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ABSTRACT

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). 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.

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

JEL: G1; G11 and G14

INTRODUCTION

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.” Jegadeesh and Titman (1993). According to these anomalies, investors may be able to conceive profitable strategies based on past returns’ observation. Considering the existence of this possibility, the Efficient Market Hypothesis can be seriously questioned. For that reason, the investigation of these anomalies has attracted the interest of many financial researchers and market professionals that want to explore this inefficiency.

The main base of momentum strategies is the continuation of existing trends in the market. The basic idea is that investors will buy winner and sell loser stocks, because it is more likely that a rising asset price continues to rise further than the opposite, at least in the short-term (Jegadeesh and Titman, 1993). The Jegadeesh and Titman (1993) methodology is followed and study is to focus on daily momentum strategies in Indian context. Additionally, by examining the profitability of momentum strategies, the research intends to investigate the weak form efficiency of the Indian stock markets. If market is efficient in weak form, current prices fully reflect all historical information.

The momentum strategies have attracted considerable attention because their consistent profitability poses a strong challenge to the efficient market hypothesis. The momentum phenomenon is puzzling as we are still not clear about the economic mechanism that drives it. The paper is organized as follows; Section 1: Review of literature, Section 2: Data and methodology, Section 3: Analysis and findings, Section 4: Conclusions.

1. LITERATURE REVIEW

A momentum strategy aims to capitalize on the continuance of existing trends in the market. This strategy is based on the belief that large price increases of a security will be followed by additional gains and vice versa for declining values. The fundamental idea is that the investor will buy winner stocks and sell loser, because, according to this strategy, it is more likely that a rising asset price continues to rise further than to move against the trend (Jegadeesh and Titman, 1993). The original findings of Jegadeesh and Titman (1993) appear to be applicable in other markets besides the United States.

Diverging Chui *et al.* (2000) conclusions for the Japanese stock market, Chaves (2012) shows that momentum strategies can be profitable in Japan, but only when the return component due to market beta exposure is removed, thus reducing the volatility of momentum strategies (Chaves, 2012).

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 US 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 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.

While the momentum profitability in short horizons have been well accepted, financial economists are far from reaching consensus on the causes of momentum profits. Jegadeesh and Titman (2001a) considers the under-reaction to new information as a natural explanation for those profits. “(...) if a firm releases good news and stock prices only react partially to the good news, then buying the stocks after the initial release of the news will generate profits. However, this is not the only source of momentum profits.” Jegadeesh and Titman (2001).

In case momentum profits are indeed driven by under-reaction, the good performance of a winner portfolio will continue until all the news is incorporated in prices. Chan *et al.* (1996) and Hong *et al.* (2000) found evidence consistent with this explanation.

The behavioral models attempt to explain the momentum profits through investors' overconfidence or by the way that investors interpret firm's specific information. These models are based on the idea that momentum profits arise because of inherent biases (Jegadeesh and Titman, 2001).

Ansari and Khan (2012) applied momentum strategies on monthly data from 1994-2006 from Indian stock markets and observed profitable momentum strategies rejecting weak form of market efficiency.

2. 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 momentum 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 rationale 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
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For application of TRB rules, recent maximums and minimums as the extreme observations over the price history window are located. 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.

3. ANALYSIS AND FINDINGS

The hypothesis H_0 {'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.

Momentum in daily returns is unexplained area in Indian context. Ansari and Khan (2012) conducted study on momentum strategies but it is based on monthly momentum strategies.

Table 3 shows the results of Momentum strategy tests for daily log returns of stocks for total ten year period. Results of Momentum strategies (65, 65) & (130, 130) with daily return series reject the null hypothesis in turn reject 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 momentum strategy hypothesis rejections.

Table 3: Summary of Momentum test for daily log returns of individual stocks

Period	Frequency of Data	Daily (65, 65)	Daily (130, 130)
April 2000 to March 2010	t statistics	19.32	-8.89
April 2000 to March 2010	Hypothesis H_0	Rejected	Rejected

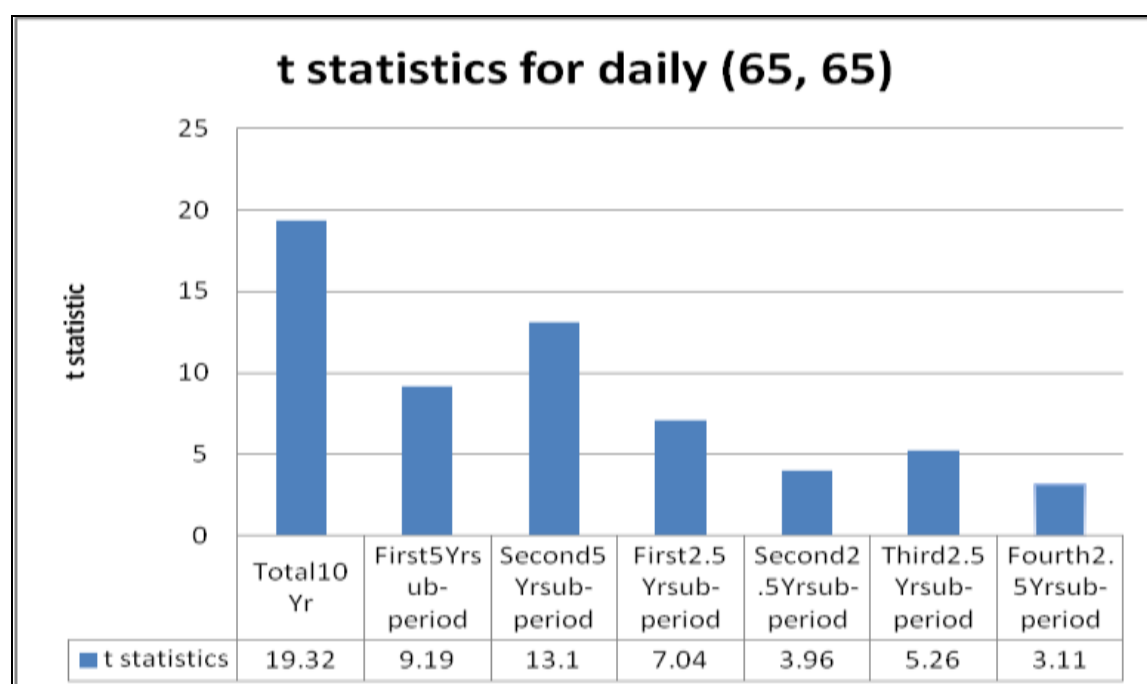
Among the two strategies considered for analysis, the (65, 65) momentum strategy is found to be superior in comparison with other (130, 130) strategy in case of daily data.

Table 4 shows the results of Momentum strategy (65, 65) tests for daily log returns of stocks for all sub-periods.

Table 4: Sub-period Daily Momentum (65, 65) test results

Period	t statistics	Hypothesis H_0
Total10Yr	19.32	Rejected
First5Yrsub-period	9.19	Rejected
Second5Yrsub-period	13.1	Rejected
First2.5Yrsub-period	7.04	Rejected
Second2.5Yrsub-period	3.96	Rejected
Third2.5Yrsub-period	5.26	Rejected
Fourth2.5Yrsub-period	3.11	Rejected

Fig 1: Graphical sub-period Daily Momentum (65, 65) test results



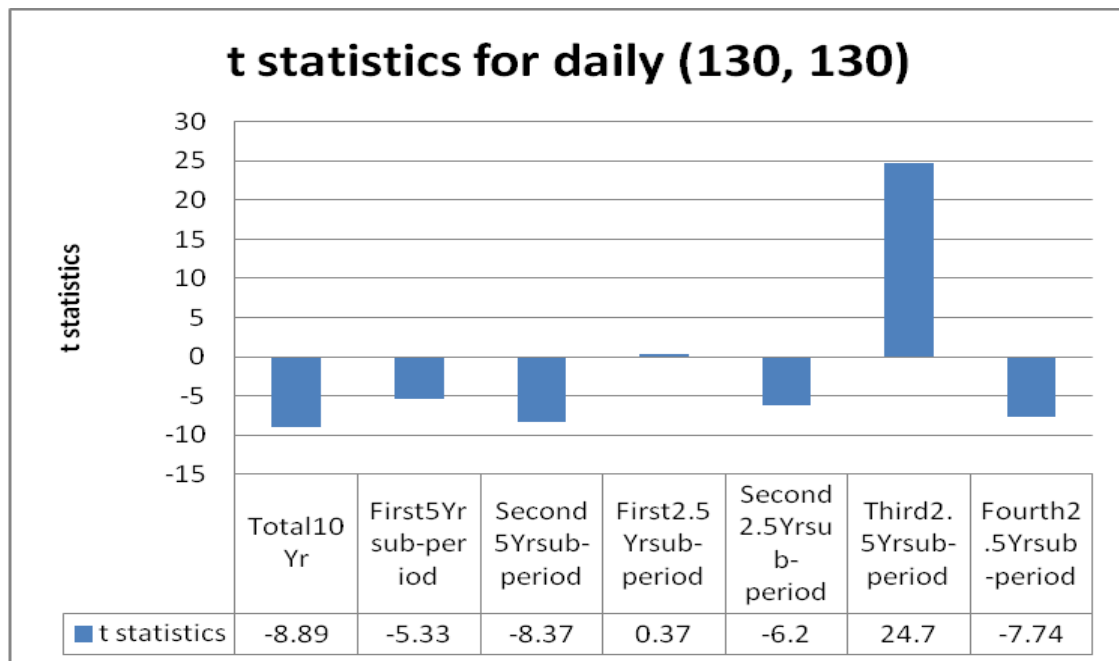
In case of (65, 65) momentum strategy for all seven sub-periods the null hypothesis of weak form of market efficiency is rejected. The t statistics is observed to gradually decreasing from large positive values for total 10 year period to Fourth 2.5 year sub-period.

Table 5 shows the results of Momentum strategy (130, 130) tests for daily log returns of stocks for all sub-periods.

Table 5: Sub-period Daily Momentum (130, 130) test results

Period	t statistics	Hypothesis Ho
Total10Yr	-8.89	Rejected
First5Yrs sub-period	-5.33	Rejected
Second5Yrs sub-period	-8.37	Rejected
First2.5Yrs sub-period	0.37	Accepted
Second2.5Yrs sub-period	-6.2	Rejected
Third2.5Yrs sub-period	24.7	Rejected
Fourth2.5Yrs sub-period	-7.74	Rejected

Fig 2: Graphical sub-period Daily Momentum (130, 130) test results



In case of (130, 130) strategy for First 2.5 Year sub-period the hypothesis is accepted with t statistics at 0.37. However, for all other six sub-periods the momentum (130, 130) strategy rejected null hypothesis of weak form of market efficiency. The t statistics is observed to be mostly in negative zone without any specific pattern for total 10 year period to Fourth 2.5 year sub-period.

The Trading Rule TRB test could not reject the null hypothesis H_0 indicating the return series is weak-form efficient. It means the daily and weekly log returns of stocks accept hypothesis $\{RW2 \text{ wherein } \epsilon_t \sim INID \text{ (independently and not identically distributed disturbance terms)}\}$ for all sub-periods and stock portfolios.

The Momentum Strategies provide significant returns i.e. Past winners outperform past losers in future. These results are in line with the studies of Chan et al. (1996), Jegadeesh & Titman (1999) and Ansari and Khan (2012). The existence of momentum in stock returns is against the weak-form market efficiency. However, the factors responsible for momentum returns are difficult to explain. According to behavioral economists momentum profits arise because of inherent biases in the way that investors interpret information. Others, however, argue that profitability of momentum strategies may simply be compensation for risk.

4. 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.

Therefore, it is possible to predict future returns based on past performance, at least in the short run in Indian context. The findings seriously question the Weak Form of Market Efficiency Hypothesis in the Indian stock market, since, according to this assumption, there is no possibility to conceive profitable strategies based on past returns. Although the main findings of study point to the existence of momentum profits in the Indian stock market, the momentum causes are not, yet, fully ascertained. The daily momentum strategies can be executed by the investor to generate significant profits. The explanation of momentum remains challenge in literature. The behavioral factors may account for the momentum phenomena.

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