A STUDY ON WEAK FORM EFFICIENCY WITH SPECIAL REFERENCE TO SELECTED AUTOMOBILE COMPANIES IN NATIONAL STOCK EXCHANGE OF INDIA LTD

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ABSTRACT

The stock market is an emerging area for research and this work analyses the efficiency of National Stock Exchange India Ltd (NSE) and focuses on selected Automobile companies. The main objective of is to find out efficiency level and random walk nature of National Stock Exchange of India Ltd. This will be accomplished by testing selected Automobile companies with the help of Descriptive Statistics, Runs Test, and Augmented Dickey Fuller test (ADF) etc., the researcher was used five years daily data from January 2012 to December 2016. The result was found that the linear dependence is existed in the selected Automobile companies' returns and the selected Automobile companies in National Stock Exchange of India Ltd are not weak-form efficient.

Keywords: Market Efficiency, Unit Root Test, EMH, Runs Test.

I. INTRODUCTION

The two fold changes have made pavement for remarkable growth and development of Indian economy. They are Information Technology and Economic liberalisation policy. The developments in Information Technology have provided enormous opportunity to facilitate trading process between investor and Industry. The Economic Liberalisation in India was introduced in India during the early 1980 and it was improved much in mid-eighties. The Balance of Payment (BOP) crisis was faced by India in 1991 that had led to pledge gold to foreign countries and the Economic Liberalisation is also providing various reforms in India from 24 July, 1991.

The economic liberalisation policy includes salient features like Liberalisation, Privatisation and Globalisation (LPG). It is offering more freedom to the service sector that has enabled more contributions to GDP growth because of more service imports and also generating foreign exchange.

The Pokhran – II a bomb test explosion has received the global attention towards India and was also supported for the growth of India because of credit rating by Moody's. It is also increased the investment level of CNX Nifty in 2003. The Exchange Traded Funds (1989), Liberalised Remittance Scheme (2004) etc., were contributed for the growth of India. We can say that 2003 to 2007 was the golden period of Indian Stock Market after liberalisation. In 2010 India was in 124th rank out of 174 countries in Index of Economic Freedom World

Rankings. Recently in 2012 the Foreign Direct Investment of 51% in retail sector was approved by Indian Government.

This is a puzzle for a common investor to understand how market is reacting based on outsiders' information (i.e. the news from various Medias, Financial announcement by companies or big players in the market). When a market is having insiders trading that will lead to increase the volatility of the market. It is essential to know whether market is reacting according to the outsiders' information or not. We are able to test the Market Efficiency viz., Efficient Market Hypothesis (EMH) or Joint Market Problem (JMP).

Eugene Fama (1960) has introduced three different forms of efficiency. They are a) Weak form Efficiency b) Semi-strong Efficiency c) Strong form Efficiency.

Weak form Efficiency has been understood as the future prices cannot predicted by using past price. If the asset prices do not have "Patterns" then it means that the price must follow random walk. In an in-efficient market the investor will not able to book profits more than the market return.

 If it is the case then short term traders may book profits. In Semi-strong form Efficiency the share prices are adjusted based on new information. So the investor is not able to earn more than the market return because the price is not only depending on past price but also the information regarding corporate announcement, dividend, bonus issue, rights issue etc., these movements will revert back to the customary level after some point of time.

 In case of Strong form Efficiency the share prices are not able to predict via past price and changes in the past price. It is known as Insiders Trading. This was empirically tested through the study by Eugene F. Fama, Lawrence Fisher, Michalel C. Jensen and Richardroll, entitled on "The Adjustment of Stock Prices to new Information" (International Economic Review; Vol. 10, February, 1969).

 It was also witnessed that the stock price has immediately reacting regard to share split and it was concluded that the stock market adjusted rapidly to new information.

Indian capital market is divided in two types. They are Primary market and Secondary market. In India's concern BSE and NSE are the main players in Indian Capital Market.

II. LITERATURE REVIEW

Pandey Ajay (2005) reported the empirical performance of various unconditional volatility estimators and conditional volatility models by using S&P CNX Nifty, India. The results indicated, that the conditional volatility models provide less biased estimates, extreme-value estimators are more efficient estimators of realized volatility.

As far as forecasting ability of models is concerned, conditional volatility models fare extremely poorly in forecasting five-day (weekly) or monthly realized volatility. In contrast, extreme value estimators, other than the Parkinson estimator, perform relatively well in forecasting volatility over these horizons.

Barman and Samanta (2006) in their study examined the EMH in Indian market and explained that the study finding do not support the EMH and volatility test also exhibits the prances of excess volatility in the return series.

The study also accepted that the hypothesis of no integration between real price and real dividends series indicating the lack of market efficiency.

MadhuriMalhotra, Thenmozhi. M, G Arun Kumar (2007), in their paper titled "Stock Market Reaction and Liquidity Changes around Bonus Issue Announcement: Evidence from India" by (2007), examined share price reaction to the announcement of bonus issue for a sample of Indian companies. Standard event study methodology has been used for the purpose of studying the Bonus issue announcement reaction. Bonus issue announcement yields negative abnormal returns around the announcement date. There is a negative reaction after the bonus issue announcement conveying that the market under reacts after the announcement. It is also observed that there is no information leakage prior to the announcement.

Ramana Rao & Naliniprava Tripathy (2008) in their study considered Indian stock market is being regarded as the barometer of the health of the economy. The study concluded that the market would react very sharply to economic, political and policy issues. Hence the market participants should be taken care of their portfolio while investing in these volatile months.

III. OBJECTIVES OF THE STUDY

➢ To examine the random walk hypothesis in selected Automobile companies in NSE.

➢ To test the weak form efficiency in NSE with reference to selected Automobile companies.

➢ To provide suggestions for the policy makers, academicians and research community.

IV. METHODOLOGY

To investigate the effectiveness of Weak form Efficiency in Indian Stock Market through some statistical tools and econometrics tools. The sample has been derived from the National Stock Exchange India Ltd (NSE). The sample includes the closing price of the selected Automobile companies listed in NSE.

V. SOURCE OF THE DATA

The National Stock Exchange India Ltd (NSE) operates from Monday to Friday. The sample includes monthly closing price of selected companies from January 2012 to December 2016 for Ashok Leyland, Bharat Gears, Lumax Auto Technologies, Mahindra & Mahindra, Rico Auto Industries, TATA Motors and TVS Motors.

VI. TEST OF HYPOTHESIS

H_0: Selected companies follow random walk, thus weak-form efficient.

H_1: Selected companies do not follow random walk, thus weak-form inefficient.

VII. TOOLS USED FOR ANALYSIS

In order to examine the hypothesis, we have used following statistical and econometrics tools based on existing literature and the collected data are converted into Natural Logarithm for better use of following tools

• Descriptive Statistics

• Unit Root Test

• Run Test

VIII. DESCRIPTIVE STATISTICS

Descriptive statistics is used to explain the basic characteristics of the data in a study with the help of Mean, Median, Standard Deviation, Skewness and Kurtosis etc.. Descriptive statistics help us to simply large amounts of data in a sensible way and present quantitative descriptions in a manageable form. Each descriptive statistic reduces lots of data into a simpler summary. Preliminary analysis was performed before applying the tests of linear dependence in order to get an insight into the important features of the series returns.

Table 1 reports a summary of the preliminary statistics for the return series of each constituent. As can be seen from the table, the entire sample has the same stylised characteristics. All the series are Leptokurtic, since the value of Kurtosis for all which are greater than the value for standard normal distribution's leptokurtosis.

Table - 1 Descriptive Statistics

Company Name	Mean	Median	Standard Deviation	Skewness	Kurtosis
Ashok Leyland	0.0285	0.0375	0.1356	0.5932	4.6660
Bharat Gears	0.0316	-0.0041	0.1689	1.2554	4.4146
Lumax Auto	0.0415	0.0052	0.1346	1.3345	5.2974
M & M	0.0374	0.0229	0.1099	1.4954	8.6369
Rico Auto	0.0224	-0.0477	0.1992	1.7564	6.9280
TATA Motors	0.0588	0.0458	0.1456	0.4400	3.2075
TVS Motors	0.0518	0.0375	0.1548	0.5233	2.7674

IX. ASHOK LEYLAND

Descriptive statistics for Ashok Leyland, the mean average returns were 0.0285 which shows the minimum performance. The standard deviation (0.1356) also shows the minimum performance. The performance of skewness shows positive one, say 0.5932. The kurtosis also shows the positive performance (4.6660).

X. BHARAT GEARS

Descriptive statistics for Bharat Gears, the mean average returns were 0.0316 which shows the minimum performance. The standard deviation (0.1689) also shows the minimum performance. The performance of skewness shows positive one, say 1.2554. The kurtosis also shows the positive performance (4.4146).

XI. LUMAX AUTO

Descriptive statistics for Lumax Auto, the mean average returns were 0.0415 which shows the minimum performance. The standard deviation (0.1346) also shows the minimum performance. The performance of skewness shows positive one, say 1.3345. The kurtosis also shows the positive performance (5.2974).

XII. MAHINDRA & MAHINDRA

Descriptive statistics for Mahindra & Mahindra, the mean average returns were 0.0374 which shows the minimum performance. The standard deviation (0.1099) also shows the minimum performance. The

performance of skewness shows positive one, say 1.4954. The kurtosis also shows the positive performance (8.6369).

XIII. RICO AUTO

Descriptive statistics for Rico Auto, the mean average returns were 0.0224 which shows the minimum performance. The standard deviation (0.1992) also shows the minimum performance. The performance of skewness shows positive one, say 1.7564. The kurtosis also shows the positive performance (6.9280).

XIV. TATA MOTORS

Descriptive statistics for TATA Motors, the mean average returns were 0.0588 which shows the minimum performance. The standard deviation (0.1456) also shows the minimum performance. The performance of skewness shows positive one, say 0.4400. The kurtosis also shows the positive performance (3.2075).

XV. TVS MOTORS

Descriptive statistics for TVS Motors, the mean average returns were 0.0518 which shows the minimum performance. The standard deviation (0.1548) also shows the minimum performance. The performance of skewness shows positive one, say 0.5233. The kurtosis also shows the positive performance (2.7674).

XVI. UNIT ROOT TEST

The study first tests the stationarity of the time series for price changes. Engle and Granger (1982) have shown that many time series variables are non-stationary or different order of integration *i.e.* I (1) series. Since most of time series have unit roots and are non stationary as indicated, by Nelson and Plosser (1982) and as proved by Stock and Watson (1988) that conventional regression techniques on non-stationary time series may produce spurious regression. Hence, the Augmented Dickey Fuller (ADF) test and Phillips-Perron (PP) test are employed to infer the stationarity of the series.

Table – 2 ADF & PP Test

Company Name	Augmented Dickey Fuller Test				Phillips – Perron Test			
	Intercept	1%	5%	10%	Intercept	1%	5%	10%
Ashok Leyland	-6.9836	-3.5482	-2.9126	-2.5940	-6.9836	-3.5482	-2.9126	-2.5940
Bharat Gears	-7.7842	-3.5482	-2.9126	-2.5940	-7.8020	-3.5482	-2.9126	-2.5940
Lumax Auto	-6.3923	-3.5482	-2.9126	-2.5940	-6.7345	-3.5482	-2.9126	-2.5940
M & M	-5.4922	-3.5550	-2.9155	-2.5955	-7.6468	-3.5482	-2.9126	-2.5940
Rico Auto	-6.5975	-3.5482	-2.9126	-2.5940	-6.8074	-3.5482	-2.9126	-2.5940
TATA Motors	-7.0510	-3.5482	-2.9126	-2.5940	-7.1460	-3.5482	-2.9126	-2.5940
TVS Motors	-6.0288	-3.5482	-2.9126	-2.5940	-6.1664	-3.5482	-2.9126	-2.5940

Note: The significant value at 1% for Augmented Dickey Fuller Test for intercept, trend and with both are -3.4768, -2.5813 and -4.0239 respectively.

The above Table 4.2 is shows that results of Unit Root Test of ASHOK LEYLAND returns for the study period. The computed value of ADF test statistics is -6.9836 and with the probability value of 0.0000. The computed ADF test-statistics -6.9836 is greater than the critical values -3.5482, -2.9126 and -2.5940 at 1%, 5% and 10% significant level respectively

Table 2 represent test critical values of t-statistics like Intercept, Trend and Both by Unit Root Test using both the Augmented Dickey Fuller (ADF) test and Phillip Peron (PP) test for the volatility series. The Critical Values are -3.4768 (Intercept), -2. 5813 (Trend) and -4.0239 (Both). It is found that the Test Statistic Values are satisfied at Level Difference itself and the select companies are stationary at 1% significant level in the First Difference. It is to be noted that the P-P test statistic values are more negative than the Test Critical Values. The Test Statistic Values of First Difference are higher than the Test Critical Values of Level Difference. But the returns are stationary in Level Difference itself (or) the Unit Root Test results identifies that the stock price return for the select companies are stationary in Level and Intercept at the order of I (0).

XVII. RUNS TEST

The Runs test is also called as Wald-Wolfowitz test. It is a non-parametric test, checks randomness of data. A run is a sequence of identical occurrences preceded and followed by different occurrences or by none at all. To check predictability of future share price movements based on historical data. Runs test is most commonly adopted form of empirical test (Cuthbert son, 1996). Runs test have two parameters namely a) Length b) Type of run. Length is a parameter of runs test which often occurred in previous price. Runs have two types which are Positive and Negative. Numbers of runs are less than the expected; this is evidence for strong positive correlation or serial correlation or auto correlation.

Most of the Empirical evidences have found in this aspect based on earlier reviews for the usage of runs test. They are as follows, Fama (1965), Sharma and Kennedy (1977), Cooper (1982), Chiat and Finn (1983), Wong and K.Wong (1984), Yalawar (1988), KO and Lee (1991), Butter and Malaikah and Thomas (1995). From these findings null hypothesis was not rejected in most countries except India, Hong Kong, Kuwait and Saudi Arabia. Runs test can be computed by using following formula for mean equation

$$\mu = \frac{2\,N_+\,N_-}{N} + 1$$

The formula for calculating variance

$$\sigma^2 = \frac{2\,N_+\,N_-\,(2\,N_+\,N_- - N)}{N^2\,(N-1)} = \frac{(\mu-1)(\mu-2)}{N-1}.$$

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Table 3 Runs Test

Values	Ashok Leyland	Bharat Gears	Lumax Auto	M & M	Rico Auto	TATA Motors	TVS Motors
Test Value	22.68	46.165	126.455	26.185	11.26	197.695	38.45
Cases < Test Value	30	30	30	30	30	30	29
Cases >= Test Value	30	30	30	30	30	30	31
Total Cases	60	60	60	60	60	60	60
Number of Runs	13	12	7	4	6	6	8
Z	5.0627	4.0627	-0.9372	-3.9372	-1.9372	-1.9372	0.0624

The analysis of the runs test for all sample constituents is reported in Table 3. As can be noted from the table, the Z-statistics of the runs test of serial independence are significant at the one percent level for all indices which we have taken for study. The significant negative Z-values for the returns indicate that the actual number of runs is less than the expected number of runs under the null hypothesis that returns are independent. In our case, the null hypothesis of returns independence has been rejected for the entire sample which implies that there is linear dependence in Broad Market Indices.

A. Findings

Ashok Leyland

❖ Descriptive statistics for Ashok Leyland, the mean average returns were 0.0285 which shows the minimum performance. The standard deviation (0.1356) also shows the minimum performance. The performance of skewness shows positive one, say 0.5932. The kurtosis also shows the positive performance (4.6660).

❖ The results of Augmented Dickey Fuller Test are noted that the Ashok Leyland is stationarity in the level difference itself with the value of -6.9836.

❖ The results of PP Test are noted that the Ashok Leyland is stationarity in the level difference itself with the value of -6.9986.

❖ The runs test converts the total number of runs into a Z statistic (5.0627).

❖ We found negative correlation of - 0.2120 in Ashok Leyland.

Bharat Gears

❖ Descriptive statistics for Bharat Gears, the mean average returns were 0.0316 which shows the minimum performance. The standard deviation (0.1689) also shows the minimum performance. The performance of skewness shows positive one, say 1.2554. The kurtosis also shows the positive performance (4.4146).

❖ The results of Augmented Dickey Fuller Test are noted that the Bharat Gears is stationarity in the level difference itself with the value of -7.7842.

❖ The results of PP Test are noted that the Bharat Gears is stationarity in the level difference itself with the value of -7.78020.

❖ The runs test converts the total number of runs into a Z statistic (4.0627).

❖ We found negative correlation of -0.1884 in Bharat Gears.

Lumax Auto

❖ Descriptive statistics for Lumax Auto, the mean average returns were 0.0415 which shows the minimum performance. The standard deviation (0.1346) also shows the minimum performance. The performance of skewness shows positive one, say 1.3345. The kurtosis also shows the positive performance (5.2974).

❖ The results of Augmented Dickey Fuller Test are noted that the Lumax Auto is stationarity in the level difference itself with the value of -6.3923.

❖ The results of PP Test are noted that the Lumax Auto is stationarity in the level difference itself with the value of -6.7345.

❖ The runs test converts the total number of runs into a Z statistic (-0.9372).

❖ We found negative correlation of -0.4157 in Lumax Auto.

Mahindra & Mahindra

❖ Descriptive statistics for Mahindra & Mahindra, the mean average returns were 0.0374 which shows the minimum performance. The standard deviation (0.1099) also shows the minimum performance. The performance of skewness shows positive one, say 1.4954. The kurtosis also shows the positive performance (8.6369).

❖ The results of Augmented Dickey Fuller Test are noted that the Mahindra & Mahindra is stationarity in the level difference itself with the value of -5.4922.

❖ The results of PP Test are noted that the Mahindra & Mahindra is stationarity in the level difference itself with the value of -7.6468.

❖ The runs test converts the total number of runs into a Z statistic (-3.9372).

❖ We found negative correlation of -0.0465 in Mahindra & Mahindra.

Rico Auto

❖ Descriptive statistics for Rico Auto, the mean average returns were 0.0224 which shows the minimum performance. The standard deviation (0.1992) also shows the minimum performance. The performance of skewness shows positive one, say 1.7564. The kurtosis also shows the positive performance (6.9280).

❖ The results of Augmented Dickey Fuller Test are noted that the Rico Auto is stationarity in the level difference itself with the value of -6.5975.

❖ The results of PP Test are noted that the Rico Auto is stationarity in the level difference itself with the value of -6.8074.

❖ The runs test converts the total number of runs into a Z statistic (-1.9372).

❖ We found negative correlation of -0.0334 in Rico Auto.

TATA Motors

❖ Descriptive statistics for TATA Motors, the mean average returns were 0.0588 which shows the minimum performance. The standard deviation (0.1456) also shows the minimum performance. The performance of skewness shows positive one, say 0.4400. The kurtosis also shows the positive performance (3.2075).

❖ The results of Augmented Dickey Fuller Test are noted that the TATA Motors is stationarity in the level difference itself with the value of -7.0510.

- The results of PP Test are noted that the TATA Motors is stationarity in the level difference itself with the value of -7.1460.
- The runs test converts the total number of runs into a Z statistic (-1.9372).
- We found negative correlation of -0.0650 in TATA Motors.

TVS Motors

- Descriptive statistics for TVS Motors, the mean average returns were 0.0518 which shows the minimum performance. The standard deviation (0.1548) also shows the minimum performance. The performance of skewness shows positive one, say 0.5233. The kurtosis also shows the positive performance (2.7674).
- The results of Augmented Dickey Fuller Test are noted that the TVS Motors is stationarity in the level difference itself with the value of -6.0288.
- The results of PP Test are noted that the TVS Motors is stationarity in the level difference itself with the value of -6.1664.
- The runs test converts the total number of runs into a Z statistic (0.0624).
- We found negative correlation of -0.1061 in TVS Motors.

B. Suggestions

- It is necessary for the Indian Investors to carefully study the publicly available information, because it plays a major role in analyzing the Market Efficiency and Volatility in the Stock Market.
- The regular identification of Seasonal Patterns in stock markets may help the investors to form appropriate trading strategies in the Stock Market. The study recommends that the investors may buy and sell the stocks using the best strategy.
- Integration of Stock Exchanges should be encouraged by giving incentives for establishing central trading system through interconnectivity.
- Stock markets should be made more formal Financial Institutions by curbing excessive speculation and other fraudulent practices. For this, better disclosure norm, quality intermediation services, legal and accounting practices should be introduced. Listing of Government securities in stock exchanges can help in this regard.
- Efforts should be made to increase the Investor Education and Investor Protection measures should be strengthened to bring more investors to the market, particularly the retail investors.
- Investors are advised to analyze the performance of the selected company before investing. There are a number of sources like websites from where information about the company can be received.
- Don't put all your money in one stock or in one sector. Select one good stock in each sector and diversify your investments.
- Don't buy in Bulk quantities. Share price fluctuates in every second. So if you put all your money at once then you will not be able to buy more when it goes down. So buy in small quantities in each dips.
- The investor buy the shares at support level sell at resistance level.
- To maintain a strict stop loss for reduce the level of loss.

❖ Finally, the findings of this study has a message for the market regulators that risk management practices should be further strengthened to take care of greater market volatility associated with an increase in the volume of trading.

XVIII. CONCLUSION

The weak-form efficiency has been widely investigated in both developed and developing markets. This research examined the existence of the random walk hypothesis (RWH) by testing the weak-form efficiency in the National Stock Exchange India Ltd returns using parametric and nonparametric linear tests. The data included the monthly closing price of selected Automobile companies in National Stock Exchange India Ltd was taken to investigate Samuelson's dictum that the efficient markets hypothesis works much better for individual stocks than it does for the aggregate stock market index.

The results obtained from the linear serial dependence tests indicate that linear dependence is existed in the NSE (Broad Market Indices) returns. Thus, based on the first hypothesis of this study the null hypothesis has been rejected, and we concluded that the Broad Market Indices in National Stock Exchange India Ltd is not weak-form efficient. However, the existing or rejection of linear serial dependence does not necessarily mean that nonlinearity exists. Nonetheless, the NSE needs to be studied further with different samples, time series, and other tests to verify market efficiency and day-of-the-week effect.

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