



## A STUDY ON WEAK FORM EFFICIENCY IN SELECTED INDIAN COMPANIES CROSS LISTED IN NYSE

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### ABSTRACT

There are investors who wish to invest or lend their resource to the corporate having no idea on how the corporate function which is less transparent. This paves way for every investor to check the basics of investing by way of doing fundamental analysis investigating the financial strength and the factors impacting the finances and its business functions. Efficient market Hypothesis (EMH) is used to analyse the selected companies by way of checking the randomness, stationarity and weak form of efficiency using Descriptive analysis, ADF Test, Runs Test, Auto correlation and TGARCH for the selected companies 5 out of 11 cross listed companies in the New York Stock Exchange (NYSE) having origin from India. The outcome of this research shows that there is no weak form of efficiency among the selected companies.

**KEYWORDS** : BSE Ltd – Bombay Stock Exchange Ltd, EMH – Efficient Market Hypothesis, ADF – Augmented Dickey-Fuller Test

### INTRODUCTION

The financial market is the inevitable part of any economy without which no transactions would happen. The efficiency of the economy is measured by the financial strength and the financial markets robustness. The financial market in general is comprised of Banking institutions, Capital markets, Non-Banking, Financial Institutions (NBFC's) and individual financiers. These financial institutions revolve around the services offered to individuals, corporate and other institutions which makes the economy to move. Capital markets have direct implications in the financial goals of any investors as there is no guaranteed return, but high potential to make more profits when the investor choose the right investment product. The investors are basically active, who takes part on everyday transactions by way of dealings and passive investors who invest for long term and show less participation in day to day transactions. The active investor takes a higher risk comparing the passive investor as he intends to take advantage over market movement and passive will study the market efficiency and fundamentals before making and transaction bit with the sole objective of making more money out of the investment.

### THE CONCEPT OF MARKET EFFICIENCY

The capital market is said to be effective and efficient only when the relevant information about a particular stock or the market. The stock market researcher Bachelier (1900) suggested that "past, present and even discounted future events are reflected in market price, but often show no apparent relation to price changes" in his research degree thesis. Eugene Francis "Gene" Fama in May 1970 introduced three different forms of market efficiency such as i) Strong Form; ii) Semi-Strong form; and iii) weak form of efficiencies depending on the kind of information prices should incorporate. According to him, weak form efficiency is a market condition wherein current stock prices reflect all information's contained in historical prices, whereas semi-strong form of efficiency reflects not only all information's in the record of past prices, but also all other publicly available information and in the strong form of efficiency, the security prices fully reflect all available information's, whether available publicly or in private. However, markets in all the developing economies are considered to be less efficient as their operating characteristics such as market size, regulation, costs and the characteristics of the investors and varying amount of information's available with different participants.

### PROFILE OF SELECTED COMPANIES AND ITS CONSTITUENT BSE INDICES

There are 5289 companies listed in Indian stock markets either in BSE or NSE or in both. However, only 11 companies having its origin from India got listed in New York Stock Exchange, namely Wipro Ltd, Vedanta Ltd, WNS Holdings Ltd, HDFC Bank Ltd, MakeMy Trip Ltd,

Sify Technologies Ltd, Dr. Reddy's Laboratories Ltd, Rediff.com India Ltd, ICICI Bank Ltd, Infosys Ltd and Tata Motors Ltd. Among the eleven companies, Infosys Ltd from IT sector, ICICI Bank Ltd from Banking sector, Vedanta Ltd from Mining's, Tata Motors Ltd from Automobile sector and Dr. Reddy's laboratories Ltd from Pharmaceutical sector being chosen for analysis based on sole discretion of the researcher. Vedanta Ltd has started trading in NYSE since 2007, Dr. Reddy's Laboratories Ltd from April 2001, ICICI Bank Ltd from 1999, Infosys Ltd from 2012 and Tata Motors Ltd from 2004.

### STATEMENT OF THE PROBLEM

The stock markets grow year to year as there is larger participation from different types of investors like retail/individual investors, Foreign Portfolio Investors and Qualified Institutional Investors. Among the three, retail investors being the part and parcel of the markets were making their hard-earned money grow. Institutional investors are the ones who make investments as a business and retail investors as savings with the expectation of making good returns but with less knowledge. The flow of information is much faster to institutional buyers than the retail investors. This puts the retail investors in jeopardy as they take high risk by investing without any strong analysis. However, the retail investor can also manipulate the publicly available information's with the use of basic statistical tools which may help the investor in making wise investment decision and one of the method being widely accepted and used in Efficient Market Hypothesis test to evaluate the efficiency of the selected stock to make investment decision.

### OBJECTIVES OF THE STUDY

1. To study the pattern in returns among the selected indices
2. To examine the stationarity and randomness of selected companies
3. To identify the volatility of selected companies
4. To check whether indices follow normal distribution.
5. To suggest the investors in choosing the indices and stocks based on the efficiency of Indices

### METHODOLOGY OF THE STUDY

#### RESEARCH DESIGN

The research is descriptive and analyse the weak form of efficiency of selected companies having listed in foreign markets (New York Stock Exchange in this research) having its origin from India.

### SAMPLE SELECTION

The study is attempted to test the efficiency of Infosys Ltd from IT sector, ICICI Bank Ltd from Banking sector, Vedanta Ltd from Mining's, Tata Motors Ltd from Automobile sector and Dr. Reddy's laboratories Ltd from Pharmaceutical sector which are cross listed in different markets.

**PERIOD OF THE STUDY**

The period of study comprises 2 years average daily returns of the selected companies. The daily returns were collected from NSE India Ltd website dated since Aug 03, 2015 to Aug 01, 2017 (2 Years).

**TOOLS USED FOR ANALYSIS**

- Descriptive statistics
- Augmented Dickey-Fuller Test
- Runs Test
- Autocorrelation test
- T-GARCH

**HYPOTHESIS OF THE STUDY**

The Null Hypothesis being framed keeping in mind that the study is about the weak form of efficiency of the selected companies and its indices.

$H_{01}$ : There is stationary in the returns of Selected companies and its constituent Indices

$H_{02}$ : The change in prices of selected companies followed the random distribution.

$H_{03}$ : There is a weak form efficiency in the returns of selected companies and its constituent Indices.

**ANALYSIS AND INTERPRETATION**

The daily returns of the selected indices were used for analysis. The data for past 2 years being used by calculating the average return using the formula (today's closing price – Previous day's closing price) divided by today's closing price to arrive at the change in returns for the selected companies. The tests included ADF test, Runs Test, Autocorrelation and T-GARCH tests being used.

The below is the outcome of the descriptive statistics employed to find the Mean, Standard Deviation, Skewness and Kurtosis from the returns data of all the selected companies.

**Table - 1 Analysis of Descriptive Statistics of selected cross listed companies from India**

Script Name	Mean	SD	Skewness	Kurtosis
Dr. Reddy's Laboratories Ltd	-0.001216	0.018665	-2.247094	20.10673
ICICI Bank Ltd	-0.000218	0.020932	0.00334	5.702059
Tata Motors Ltd	2.68E-05	0.023787	-0.378097	5.472456
Vedanta Ltd	0.00104	0.032394	-0.291019	5.75163
Infosys Ltd	-0.000249	0.014673	-0.545637	7.150988

**Source: Daily Returns collected from NSE website computed using E-Views**

Table 1 shows that the mean values indicating positive for Tata Motors Ltd and Vedanta Ltd. The standard deviations show positive to all the companies which are plotted normally from the mean. The analysis shows that there is high risk of returns while investing in Tata Motors Ltd and Vedanta Ltd having standard deviations 0.023787 and 0.032394 respectively.

The companies having positive skewness (Right Skewed Distribution) which means that the possibility of making positive returns are higher. ICICI Bank Ltd having positive skewness (Right Skewed Distribution) is positively deviated from the normal distribution shows that there is the possibility of making positive returns.

It is inferred that the companies having Kurtosis value greater than three (Leptokurtic Distribution) indicates that unexpected return distributions are not normal and all the selected companies having value greater than three.

**ADF TEST**

The below is the outcome of the Augmented Dickey-Fuller's Test from the returns data of all the selected companies.

**Table - 2 Analysis of ADF Test for selected cross listed companies from India**

Name of the Company	Test statistic	ADF test
	Significant level	Level difference
Dr. Reddy's Laboratories Ltd	<b>Test Statistics</b>	-19.32435
	<b>1%</b>	-3.443388
	<b>5%</b>	-2.867183
	<b>10%</b>	-2.569837
ICICI Bank Ltd	<b>Test Statistics</b>	-21.30671
	<b>1%</b>	-3.443388
	<b>5%</b>	-2.867183
	<b>10%</b>	-2.569837
Tata Motors Ltd	<b>Test Statistics</b>	-21.40363721
	<b>1%</b>	-3.443387661
	<b>5%</b>	-2.86718282
	<b>10%</b>	-2.569837425
Vedanta Ltd	<b>Test Statistics</b>	-21.00488227
	<b>1%</b>	-3.443387661
	<b>5%</b>	-2.86718282
	<b>10%</b>	-2.569837425
Infosys Ltd	<b>Test Statistics</b>	-22.41360913
	<b>1%</b>	-3.443387661
	<b>5%</b>	-2.86718282
	<b>10%</b>	-2.569837425

**Source: Daily Returns collected from NSE website computed using E-Views**

Table 2 shows the ADF test result of the selected companies at three different significant levels such as 1%, 5% and 10% used to test the critical values. The outcome shows that the probability value for selected companies is at Zero level.

The statistical values of ADF Test were -19.32435 for Dr. Reddy's Laboratories Ltd, -21.30671 for ICICI Bank Ltd, -21.40363721 for Tata Motors Ltd, -21.00488227 for Vedanta Ltd and -22.41360913 for Infosys Ltd. The statistical value is greater than all the test critical values at 1%, 5% and 10% levels of significance which indicates that the returns data of selected companies attained stationary. Hence, Null Hypothesis namely, "There is stationary in the returns of Selected companies", is accepted.

**RUNSTEST**

The below is the outcome of the Runs Test from the returns data of all the selected companies.

**Table - 3 Analysis of Runs Test for selected cross listed companies from India**

Name of the Company	No of Observations	No of Runs	Z value	Significant value
Dr. Reddy's Laboratories Ltd	494	267	1.711437447	0.087000389
ICICI Bank Ltd	494	247	-0.090075655	0.928227095
Tata Motors Ltd	494	249	0.090075655	0.928227095
Vedanta Ltd	494	252	0.360302621	0.71862084
Infosys Ltd	494	260	1.080907862	0.279738101

**Source: Daily Returns collected from NSE website computed using SPSS**

Table 3 shows that the analysis of z-value of stands at 1.711437447, -0.090075655, 0.090075655, 0.360302621 and 1.08097862 for Dr. Reddy's Laboratories Ltd, ICICI Ban Ltd, Tata Motors Ltd, Vedanta Ltd and Infosys Ltd respectively which falls between +/- 1.96 table value. This shows that the successive price changes are dependent and

thereby not supporting the assertion of randomness and also shows that the selected companies followed the random distribution. Therefore, the Null Hypothesis, namely, "The change in prices of selected companies follow random distribution" is accepted.

#### AUTOCORRELATION TEST

The below is the outcome of the Autocorrelation Test from the returns data of all the selected companies.

**Table - 4 Analysis of Autocorrelation for selected cross listed companies from India**

Lags	Dr. Reddy's Laboratories Ltd	ICICI Bank Ltd	Tata Motors Ltd	Vedanta Ltd	Infosys Ltd
1	0.135	0.042	0.035	0.054	-0.012
2	0.072	-0.005	-0.066	-0.033	-0.100
3	-0.049	0.034	0.029	0.022	0.030
4	-0.057	-0.101	-0.052	-0.028	-0.041
5	-0.045	-0.068	0.010	-0.086	0.029

**Table - 5 Analysis of T-GARCH for selected cross listed companies from India**

Name of the Company	Dr. Reddy's Laboratories Ltd	ICICI Bank	Tata Motors Ltd	Vedanta Ltd	Infosys Ltd
$\alpha_0$	0.000242	0.000616	0.000359547	1.61584E-05	0.000153694
z-Statistics	18.91822	4.291575	6.363327755	2.344147662	7.717901443
$\alpha_1$	0.014459	0.086478	0.200650417	0.013433622	0.138833322
z-Statistics	<b>0.312902</b>	<b>1.725143482</b>	<b>3.197606592</b>	<b>1.104224804</b>	<b>1.876188349</b>
$\delta$	-0.01882	-0.462013752	0.031213548	0.943082983	0.250617785
z-Statistics	<b>-1.764887</b>	<b>-1.471225145</b>	<b>0.29339709</b>	60.01541055	2.620438065
$\beta_1$	0.97147	-0.06649056	0.332549607	0.051570168	0.072974629
z-Statistics	<b>11.4811</b>	<b>-1.116410574</b>	<b>2.762772514</b>	<b>3.850816229</b>	<b>1.002411612</b>
AIC	-5.230028	-4.890382404	-4.725148137	-4.121843439	-5.609659676
Log Likelihood	1295.817	1211.924454	1171.11159	1022.09533	1389.58594

**Source: Daily Returns collected from NSE website computed using E-Views**

$\alpha_0$ : constant in the model represents a long-run average;

$\alpha_1$ : The ARCH term which is the lag of the squared residuals from the mean equation, represents news about Volatility from the previous period;

$\beta_1$ : The GARCH term is the last period's forecast variance

$\delta$ : The TGARCH reflects the symmetrical effect of the selected company or index. If the statistical value of  $\delta$  is between +/- 1 then it is symmetrical which reflects implications of "good news" and "bad news" in the price movement.

Table 5 shows that TGARCH model for selected companies. The best fitted model selection criteria are found out of higher value of Log likelihood value and lower AIC value. The lower AIC values are presented in TGARCH (1,1) used to find out the asymmetries in terms of positive and negative implication. The results suggest that positive shocks are observed for Vedanta Ltd and Infosys Ltd at five per cent level of significant through the asymmetries  $\delta$  value whereas Dr. Reddy's Laboratories Ltd, ICICI Bank Ltd and Tat Motors Ltd has no significance. This clearly shows that Vedanta Ltd and Infosys Ltd companies price movements have asymmetrical reaction towards the good and bad news of the market. Hence, the Null Hypothesis "There is presence of asymmetries effect towards the good and bad news about the markets on the selected companies and its constituent companies" is accepted.

#### FINDINGS

- The descriptive analysis shows that there is a high risk of returns while investing in Tata Motors Ltd and Vedanta Ltd.
- The ADF test shows that the probability of selected companies is at Zero level and test value is greater than the test critical values at 1%, 5% and 10% significance level which indicates that the returns data of selected companies attained stationary.
- Runs Test shows that the statistical values of all the selected

6	-0.048	-0.075	0.021	0.001	-0.040
7	-0.015	0.037	0.035	0.077	-0.069
8	-0.012	0.029	-0.050	-0.007	-0.065

**Source: Daily Returns collected from NSE website computed using SPSS**

**Note:** \* Positive value at 5% level of significance

Table-4 shows the It is to be distinguished that there was a total of 8 lags during the study period using daily returns data. The lag no's 1 & 2 of Dr. Reddy's Laboratories Ltd and lag no's 1 & 7 of Vedanta Ltd was significant. Hence the Null Hypothesis, namely, "There is weak form efficiency in the returns of Selected S&P BSE 500 Index and Companies", is rejected.

#### T-GARCH TEST

The below is the outcome of the T-GARCH Test from the returns data of all the selected companies.

companies fall in between +/- 1.96 table value which shows that successive price changes are dependent and thereby not supporting the assertion of randomness and also shows that the selected companies followed the random distribution.

- Auto Correlation test shows that Dr. Reddy's laboratories Ltd and Vedanta Ltd had shown significant in 2 out of 8 lags and the rest of the company has no significance. There is no weak form efficiency of the selected companies were identified.
- TGARCH analysis shows that Vedanta Ltd and Infosys Ltd companies price movements have an asymmetrical reaction towards the good and bad news of the market.

#### SUGGESTIONS OF THE STUDY

- It is advisable to investor to follow the companies with good fundamentals having high liquidity and decision making based on publicly available information.
- Investor may invest in Infosys Ltd and Vedanta Ltd as it reflects the Good and Bad news of the past in the price movement.
- The implication of rejection of weak form efficiency for investors is that, it is always advisable to hold a well-diversified portfolio while investing in the selected companies for the long term.
- Finally, the findings of this study indicate that the investor need to follow the markets having different culture and regulations need to be ascertained before making an investment.

#### CONCLUSION

The efficiency of the investor relies on the sound investment decision investors makes based on his ability to predict the market. The investor can be successful only when investors searches for relevant and timely information available to him in public. It is imperative that the efficiency of the company is equally important to withstand in the business as well as in the markets else there will be no takers for the same. The testing of weak-form efficiency is one of the advanced methods to test the efficiency based on the historical returns. It is advisable to check whether the change in prices reflects the information related to that particular company or

as the whole of the markets. On the other hand, the growth of the market depends on the efficiency and there is lots of potential to make more benefits by way of gathering information available in different sources which in turn will help the economic growth.

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