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An Analysis of Weak Form Efficiency in Sectoral Indices: A Study with a Special Reference to National Stock Exchange in India

KEYWORDS: Economic growth, National Stock Exchange, Run Test, Autocorrelation, and T-Garch

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ABSTRACT *Capital market is one of the significant phases of every financial institution and now it's playing a strategic role in a country's economic growth. Apprehend that stock market is the backbone of our country it is essential to analyses the weak form efficiency of Indian stock market so as to assess the efficiency of Indian stock market and give suggestions to the investors to make their decisions on their investment. For the purpose of the study, the biggest stock exchange National Stock Exchange has been selected. The study has used the daily closing price of the stock from 1st Apr 2013 to 31st Mar 2014 comprising total of seven sectors. To test the Market Efficiency the study has used both parametric and non parametric tests like Run Test, Autocorrelation, and Augmented Dickey Fuller test. These tests are used to analyze randomness, independence, stationality for the data collected. To test the volatility T-Garch has been used. The study reveals drifts in market efficiency which offers investors a diversified way to make their investment activities in effective manner.*

Introduction

A financial market is a market in which people and entities can trade financial securities, commodities, and other fungible items. In economics, typically, the term market means the aggregate of possible buyers and sellers of a certain good or service and the transactions between the financial markets can be found in nearly every nation in the world. Investors have access to a large number of financial markets and exchanges representing a vast array of financial products. Some of these markets have always been open to private investors; others remained the exclusive domain of major international banks and financial professionals until the very end of the twentieth century. A capital market is one in which individuals and institutions trade financial securities. Organizations and institutions in the public and private sectors also often sell securities on the capital markets in order to raise funds. Thus, this type of market is composed of both the primary and secondary markets. Any government or corporation requires capital (funds) to finance its operations and to engage in its own long-term investments. To do this, a company raises money through the sale of securities - stocks and bonds in the company's name. These are bought and sold in the capital markets. Stock markets allow investors to buy and sell shares in publicly traded companies. They are one of the most vital areas of a market economy as they provide companies with access to capital and investors with a slice of ownership in the company and the potential of gains based on the company's future performance. This market can be split into two main sections: the primary market and the secondary market. The primary market is where new issues are first offered, with any subsequent trading going on in the secondary market.

Review of Literature

Mohammad Shafi (2014) probed the weak market efficiency of Indian capital market by taking 50 Nifty stocks for 11 Years 2003-2013 by using host of tests (parametric as well as non-parametric) Runs test, Augmented Dickey Fuller test, Autocorrelation. The validity of the theory of random Walk in Indian Capital markets also stands refuted as the tests used to determine the same clearly rejected the null Hypothesis of the Markets being random. The result found that the Indian Capital Markets are inefficient in the weak form. **Sushil Kumar, Manisha Singh (2013)** Investigated the efficiency of S&P CNX Nifty and CNX Nifty Junior in Indian capital market from 2000 to 2013 by using Runs test, Unit root test and Kolmogorov-Smirnov (KS) Test. Their study conducted to know whether Indian stock Market is efficient or inefficient particularly at weak level. The result found that Indian Stock markets do not exhibit weak from of market efficiency. These results suggest that it may be useful to investors given that price volatility is an important driver of active investment returns. **Kinjal Jethwani & Sarla Acthuthan (2013**) tested the Weak Form Efficiency of Indian Stock Market during, before and after financial crisis by taking the daily return series of S&P CNX Nifty (National Stock Exchange) from 1st January 1996 to 31st December 2012. Different parametric and non parametric tests are used they are Autocorrelation, Variance Ratio test, Kolmogrov Smirnov test and Runs test. The result found that Indian stock market is not weak form efficient in all periods however after 2002 stock market behaves in more efficient manner. **S. Ayyappan, S. Nagarajan, M.Sakthivadivel & K. Prabhakaran (2013)** investigated the efficiency of National Stock Exchange of India and focused on Board Indices and CNX Nifty with help of Descriptive Statistics, Runs Test, and Augmented Dickey Fuller test (ADF) from 2008 to 2013. The results obtained from the linear serial dependence tests indicate that linear dependence is existed in the NSE (Broad Market Indices) returns. The result found that the Broad Market Indices in National Stock Exchange is not weak-form efficient. **Suresh Chandra Das, Bishnupriya Mishra (2013)** tested the eight stocks of National Stock Exchange and tries to investigate the efficiency of Indian stock market. Runs test has been applied to test the random walk hypothesis i.e., weak form efficiency. This study has addressed the subject by testing the Random Walk Hypothesis and to some extent tries to formulate hypothesis by taking into account the daily prices of eight stocks. The Indian stock market is being information efficient, at least in the weak form. **Salman Ahmed Shaikh (2013)** probed with recent and comprehensive data for the empirical verification of weak form efficiency in Karachi Stock Exchange (KSE) by using Augmented Dickey Fuller (ADF) and Philips-Perron (PP) tests from 2003 to

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2013. Finally they found that KSE support weak form efficiency. And they also argue that strong form efficiency does not exist in KSE by comparing equity funds returns with KSE 100 Index returns for 10 years (2003-2012). Finally they concluded that the insider information does not provide enough to argue further in the province of strong form efficiency. **Ayhan Kapusuzoglu (2013)** probed to examine under Istanbul Stock Exchange (ISE) National 100 index whether weak form market efficiency exists or not under efficiency market hypothesis. The period of the study is 1996 to 2012. The test used for this study unit root tests. it has precipitated that set is stationary at the level (H0 hypothesis rejected). The result determined that the related set not shows random walk and in other words, ISE National 100 market is not an efficient market in weak form. **Nikunj R. Patel, Nitesh Radadia and Juhi Dhawan (2012)** investigated the weak form market efficiency of Asian four selected stock markets by taking daily closing price of stock markets under the study from the 1stJanuary 2000 to 31stMarch 2011 by Appling various test like Runs Test, Unit Root Test, Variance Ratio, Auto Correlation and other test. The Runs Test indicated BSE Sensex and NIKKEI markets are weak form inefficient whereas HANSENG and SSE Composite hold weak form of efficiency. The Autocorrelation indicated inefficient.

Statement of problem

The stock market is flourishing at a very high rate and the number of investors investing in it is also increasing. Moreover, the investors do not have any idea about which company and which indices are best in India. Therefore, the present study aims to investigate the weak form efficiency of Indian Stock Market for different sectors which were actively traded in the National Stock Exchange (NSE)

Objective of the study

The main aim of the study is to examine the weak market efficiency of the Sectoral Indices of NSE

- To examine the stationary of share price returns of Sectoral Indices of NSE
- To determine the randomness in Sectoral Indices of NSE

Scope of the Study

The findings of this study will be useful to those involved in investment decision-making in the stock market of India, as it will increase their understanding of the pricing process prevailing in the stock market.

Sample size

The Sectoral Indices are selected based on the establishment year 2004. The sectors selected are CNX Auto, CNX Bank, CNX Energy, CNX FMCG, CNX IT, CNX Metal and CNX Pharma

Research Design

The research design constitutes the blueprint for the collection, measurement and analysis of data and outlines each procedure from the hypotheses to the analysis of data. It is the plan and structure of investigation. So as to obtain answers to research questions. The type of study undertaken is Analytical. It is a study in which action will be taken on a cause system to improve the future performance

Source of Data

The data collected for the research purpose are secondary data. The corresponding share prices were the daily closing price of closing prices of the National Stock Exchange (NSE) collected from www.nseindia.com

Period of Study

The date of the sample ranges from 1st April 2013 to 31st March 2014

Tools for analysis

- Descriptive analysis
- ADF test & PP Test
- Runs test
- Autocorrelation test
- TGarch

Hypothesis of the study

H_0: is not stationary
H_1 is Stationary
H_0: Returns of Index are random.
H_1: Returns of Index are not random.
H_0: Indian stock markets are weak-form efficient
H_1: Indian stock markets are not weak-form efficient

1. Descriptive Statistics

Table-1

Analysis s of Descriptive Statistics for Sectoral indices

S. No.	Index	Mean	S.D.	Skewness	Kurtosis
1	CNX AUTO	0.001373	0.012263	0.401197	4.757874
2	CNX BANK	0.000622	0.019339	0.349769	5.650056
3	CNX ENERGY	0.000460	0.013537	-0.123558	3.574879
4	CNX FMCG	0.000745	0.012805	0.069988	5.245740
5	CNX IT	0.001096	0.014616	-1.841674	20.62928
6	CNX METAL	0.000654	0.017131	0.205389	4.397268
7	CNX PHARMA	0.001010	0.010317	-0.079885	3.134600

Source: Collected from NSE and Computed using EViews (Version7)

Table 1 presents the descriptive statistics of Sectoral indices for 1st April 2013 to March 2104.The mean values of sample CNX Auto companies are positive during the study period from 1st April 2004 to 31st March 2014. The standard deviations of sample CNX Auto companies are positive and which are plotted normally from the mean. The comparison of Skewness value clearly indicates the fact that CNX Energy and CNX IT earned negative value. According to the analysis of Kurtosis, it is to be noted that all Index was more than 3. This result indicates that the distribution of return did not follow normal distribution for Sectoral Indices during the study period.

2. Unit Root Test

Analysis of ADF Test and PP Test for Sectoral indices

Sample Index	TEST STATISTIC	ADF Test	P-P TEST
	SIGNIFICANT LEVEL	LEVEL DIFFERENCE	LEVEL DIFFERENCE
CNX AUTO	Test Statistic	-13.62218	-13.48675
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX BANK	Test Statistic	-13.77060	-13.68309

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Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX ENERGY	Test Statistic	-15.68849	-15.95327
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX FMCG	Test Statistic	-14.40371	-14.39156
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX IT	Test Statistic	-15.66438	-15.66502
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX METAL	Test Statistic	-15.75390	-15.75532
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925
CNX PHARMA	Test Statistic	-14.63341	-14.60638
Test Critical Values	1% Level	-3.456514	-3.456514
	5% Level	-2.872950	-2.872950
	10% Level	-2.572925	-2.572925

Source: Collected from NSE and Computed using EViews (Version 7)

Table 2 presents the ADF test and PP test of Sectoral indices for 1st April 2013 to March 2104. It is to be noted that the values of test critical for Sectoral Indices were calculated at significant level of 1%, 5% and 10%. The probability values for Sectoral Indices were zero. According to the analysis, the statistical values of ADF Test & P-P Test for Sectoral Analysis were less than the test critical values at 1%, 5% and 10% level of significance. This indicates the fact that the returns data of Sectoral Indices attained stationary. Hence, the Null Hypothesis **"There is no stationary in the returns of Sectoral Indices"** is rejected.

3. RUNS TEST

Sample CNX Index	No of Observations	No of Runs	Z value	Significant value
CNX AUTO	250	113	-1.640	.101
CNX BANK	250	116	-1.267	.205
CNX ENERGY	250	122	-.506	.613
CNX FMCG	250	121	-.618	.536
CNX IT	250	115	-1.379	.168
CNX METAL	250	127	.136	.892
CNX PHARMA	250	112	-1.771	.077

Analysis of Runs Test for Sectoral indices

Source: Collected from NSE and Computed using SPSS (Version 16.0)

Table 3 presents the runs test of Sectoral indices for 1st April 2013 to March 2104. The analysis of z-value of all Index fall down in-between the value of ±1.96. The Sectoral Indices are successive price changes are independent and there by supporting the assertion of random .The overall analysis of Runs Test clearly shows the fact that there was random distribution. Therefore, the Null Hypothesis **"There is no random distribution in the returns of Sectoral Indices"** is rejected.

4. Autocorrelation

Table – 4

The Results of Autocorrelation for Sectoral Indices

Lags	CNX AUTO	CNX BANK	CNX ENERGY	CNX FMCG	CNX IT	CNX METAL	CNX PHARMA
1	-.351	-.366	-.480	-.461	-.467	-.537	-.417
2	-.155	-.196	.002	-.028	-.087	.107	-.076
3	-.010	.087	.001	.014	.074	-.026	-.031
4	-.024	-.065	-.084	-.134	-.083	-.105	.004
5	-.004	.022	.086	.153	.077	.084	.058
6	.031	.061	-.051	-.065	.021	-.103	-.082
7	.116	-.018	.106	.092	-.026	.115	.066
8	-.130	-.107	-.206	-.089	.034	-.087	-.007
9	-.027	.153	.201	.097	-.025	.178	.018
10	.067	-.061	-.066	-.157	-.060	-.136	-.076
11	-.002	-.081	-.016	.007	.014	-.016	.055
12	.067	.138	.015	.150	.088	.116	-.073
13	-.153	-.077	-.087	-.106	-.088	-.162	.100
14	.038	-.060	.138	.114	.014	.069	.014
15	.064	.141	-.032	-.066	.060	.029	-.027
16	-.063	-.119	-.022	-.129	-.081	-.014	-.102
17	.093	-.003	-.032	.117	.038	-.058	.078
18	-.047	.127	.041	.023	-.060	.063	.030
19	.031	-.033	.059	-.018	.136	.041	.026
20	-.059	-.108	-.132	.000	-.074	-.109	-.118

Source: Collected from NSE and Com puted using SPSS (Version 16.0) **Note:** * Positive value at 5% level of significance

Table 4 presents the Autocorrelation of Sectoral indices for 1st April 2013 to March 2104. It is to be distinguished that there were a total of 20 lags during the study period. From the overall analysis of the returns of Sectoral Indices, it is clear that CNX Metal Index had more number of lags with positive autocorrelation value whereas the remaining CNX Index recorded low number of lags with positive significant during the study period. Hence the Null Hypothesis "**There is no weak form efficiency in the returns of Sectoral Indices"** is accepted.

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5. TGARCH

SNo	Sectoral Indices	Coefficients - TGARCH (1,1)				AIC	Log Likelihood
		α0	α1	δ	β1		
1	CNX AUTO	2.10E-06 (0.808526)	0.013615 (0.425367)	0.131797 (2.334014)	0.919384 (22.21468)	-6.000038	754.0047
2	CNX BANK	5.22E-06 (2.174669)	-0.030580 (-2.668904)	0.089892 (3.841592)	0.974924 (67.27118)	-5.138257	646.2821
3	CNX ENERGY	7.57E-06 (1.339343)	-0.036738 (-1.049623)	0.135687 (2.065284)	0.927832 (19.56039)	-5.816381	731.0477
4	CNX FMCG	3.12E-06 (1.067539)	0.094931 (3.120246)	-0.001426 (-0.034052)	0.887657 (21.65028)	6.000242	754.0303
5	CNX IT	7.54E-05 (3.535407)	0.472444 (8.003110)	-0.490229 (-8.458252)	0.399072 (2.990142)	-5.729847	720.2309
6	CNX METAL	3.06E-07 (0.373005)	-0.081621 (-5.195184)	0.210398 (5.988828)	0.985647 (449.6413)	-5.458494	686.3117
7	CNX PHARMA	8.60E-06 (1.140460)	0.003206 (0.070896)	0.106362 (1.496055)	0.868631 (9.389013)	-6.318541	793.8176

Analysis of TGARCH for Sectoral Indices

Source: Collected from NSE and Computed using EViews (Version 7)

α0: constant in the model represents a long-run average;

α1: The ARCH term which is the lag of the squared residuals from the mean equation, represents news about Volatility from the previous period;

β1: The GARCH term is the last period's forecast variance

δ - Takes the value of 1 if ε_t is negative, and 0 otherwise, identifying "good news" and "bad news" have a different impact.

Table 5 presents the TGarch for Sectoral Indices Indices for 1st April 2013 to March 2104. To find out the asymmetries in terms of positive and negative implication, the TGARCH (1, 1) model was used. The ARCH effect is insignificant for CNX AUTO, CNX ENERGY & CNX Pharma Sectoral Indices. And the GARCH effect is significant for Sectoral Indices. The results thus suggest that positive shocks are observed for all index except CNX FMCG & CNX Pharma at five per cent level of significant through the asymmetries δ value. On the other hand, the coefficient for asymmetries δ values are insignificant for CNX FMCG & CNX Pharma. The insignificant results concluded that there is no presence of asymmetries effect for the above Index.

Conclusion

The overall results of the analysis suggest that the Sectoral analyses of NSE are not weak form efficient for the period 1st April 2013 to 31st March 2014. The distribution of return did not follow normal distribution for Sectoral Indices during the period. The statistical values of ADF Test & P-P Test for Sectoral Analysis were less than the test critical values at 1%, 5% and 10% level of significance. This indicates the fact that the returns data of Sectoral Indices attained stationary. Runs Test is consistent with Autocorrelation Test which indicates a weak form of inefficient for the period. In T-Garch the coefficient for asymmetries δ values are insignificant for CNX FMCG & CNX Pharma.

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