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WEAK FORM OF MARKET EFFICIENCY: A STUDY OF SELECTED INDIAN STOCK MARKET INDICES

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Abstract: *The study of efficiency of emerging capital markets is becoming more important as a consequence of integration of these markets with more developed markets and free movements of investments across geopolitical boundaries. Now a day's Emerging Economies are catching the eyeballs of Investment Communities as they are giving far better returns then Developed nations. India being a part of this club is attracting huge foreign fund flows mainly because of policy changes and reforms introduced in the economy. Hence it is noteworthy to study the Efficiency of Indian stock market that is whether Indian Stock Market efficient or inefficient. This research paper investigates one facet of efficiency of Indian Stock market. This study is conducted to know that whether Indian stock Market is efficient or inefficient particularly at weak level. Finally, concluded that Indian Stock markets do not exhibit weak from of market efficiency.*

Keywords: *capital markets, weak form, stationary, market efficiency, Indian Stock Markets.*

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1. INTRODUCTION

"My interest is in the future because I am going to spend the rest of my life there"

The efficiency of stock market is considered as essential factor while evaluating different investment avenues. Now a day's Emerging Economies are catching the eyeballs of Investment Communities as they are giving far better returns then Developed nations. India being a part of this club is attracting huge foreign fund flows mainly because of policy changes and reforms introduced in the economy. For last two decades, India is perceived as preferred investment destination, and large institutional investors such as FIIs, Mutual funds, Hedge Funds etc… are betting big on Indian economy. India is ranked sixth among Asian emerging and frontier markets in delivering stock market returns in the year 2012 (Bloomberg). The study of efficiency of emerging capital markets is becoming more important as a consequence of integration of these markets with more developed markets and free movements of investments across geo-political boundaries. Hence it is noteworthy to study the Efficiency of Indian stock market that is whether Indian Stock Market is efficient or inefficient. This research paper investigates one facet of efficiency of Indian Stock market. This study is conducted to know that whether Indian stock Market is efficient or inefficient particularly at weak level.

2. REVIEW OF LITERATURE

Pandy A.(2003) examined three popular stock indices to test the efficiency level in Indian Stock market and the random walk nature of the stock market by using the run test and the autocorrelation function ACF (k) for the period from January 1996 to June 2002. The autocorrelation analyses and runs test concluded that the series of stock indices in the India Stock Market are biased random time series. The auto correlation analysis indicates that the behavior of share prices does not confirm the applicability of the random walk model in the India stock market. Thus there are undervalued securities in the market and the investors can always excess returns by correctly picking them.

Khan and Sana (2010) examined the efficiency of the Indian Capital Market in its semi-strong form of Efficient Market Hypothesis (EMH). The efficiency is tested in relation to the impact of Foreign Institutional Investors (FII's) largely on the Indian Capital Market. For this purpose, two major stock indices viz; National Stock Exchange (NSE) and Bombay Stock

Exchange (BSE) that represent the Indian Capital Market have been taken. The results suggested that the FII's do have significant impact on Indian Capital Market, which suggested that Indian Capital Market is semi-strong form efficient.

Gimba (2010) tested the Weak-form Efficient Market Hypothesis of the NSE by hypothesizing Normal distribution and Random walk of the return series. Daily and weekly all share index and five most traded and oldest bank stocks of the NSE are examined from January 2007 to December 2009 for the daily data and from June 2005 to December, 2009 for the weekly data. The empirical findings derived from the autocorrelation tests for the observed returns conclusively reject the null hypothesis of the existence of a random walk for the market index and four out of the five selected individual shares. In general, it can be concluded that the NSE stock market is inefficient in the weak form of efficiency. Given the empirical results that the stock market is weak-form inefficient, it is believed that anomalies in stock returns could be existent in the market and reduction of transaction cost so as to improve market activities and minimizing institutional restrictions on trading of securities in the bourse were therefore recommended.

Gupta and Yang (2011) tested the weak form efficiency or random walk hypothesis for the two major equity markets (BSE and NSE) in India for the period 1997 to 2011. Results of market efficiency was fond mixed as for quarterly data, all three methods ADF, PP and KPSS tests support the weak form efficiency for later sample period 2007 to 2011, but slight conflict for earlier period 1997 to 2007 as only PP test shows weak form inefficiency; for monthly data, all three test method are consistent on the weak form efficiency for the period 2007 to 2011 and not efficient for earlier period 1997-2007. For daily and weekly data, all three test methods reject weak form efficiency during all sample periods.

Abdullah and Ashikh (2012) found that the Saudi Stock Exchange (SSE) returns exhibit significant linear serial dependence. The hypothesis of market efficiency has been strongly rejected based on the results from the linearity tests. It was concluded that that the Saudi stock Exchange is inefficient in the weak-form of the Efficient Market Hypothesis (EMH). The result also shows evidence of day-of-the-week effects in the Saudi Stock Exchange, both in mean (returns) and variance (volatility) equation.

Nguyen, Chang and Nguyen (2012) investigated whether the Taiwan Stock market is weakly efficient by modifying and estimating Dockery and Kavussanos' multivariate model using a

set of panel data. The empirical findings suggested that the Taiwan stock market is not informational efficient, which may be attributable to the lack of broadness and depth of the market. The results further indicate that when the number of stocks included in the sample exceeds 5, the null hypothesis of the efficient market hypothesis is rejected throughout.

Mayowa Gabriel Ajao (2012), study consisted of all securities traded on the floor of the Nigerian Stock Exchange and the month end value of the All Share Index from 2001 – 2010 constitute the data analysed. The serial correlation technique of data analysis was used to test for independence of successive price movement and the distributive pattern while runs test was used to test for randomness of share price movement. The serial correlation results show that the correlation coefficients did not violate the two-standard error test.

Nikunj R. Patel,Nitesh Radadiaand Juhi Dhawan(2012), Investigated the weak form of market efficiency of Asian four selected stock markets. They have taken a daily closing price of stock markets under the study from the 1st January 2000 to 3stMarch 2011 and also divided full sample in three interval periods, various tests have been applied like Variance Ratio, Runs Test, Unit Root Test, Auto Correlation and other tests. The highest mean returns were given by BSE Sensex to the investor followed by SSE Composite and HANGSENG. It has been reported that the highest Standard Deviation was of BSE Sensex, so it could be considered as high risk market. During the period BSE Sensex, HANGSENG and SSE Composite markets showed positive average daily returns except NIKKEI.

3. METHODOLOGY:

3.1 Objective of study

1. To investigate whether Indian Stock Market is weak form efficient or not.
2. To empirically test whether Indian Stock Market follows random walk or not.

3.2 Hypothesis

Ho= There is no inter-dependence in successive price changes of individual securities.

Ho =There is no unit root in series of returns of indices of Indian capital market.

3.3 Scope of Study

The study is based on daily closing values of the S&P CNX Nifty and CNX Nifty Junior for the sample period of 1 January 2000 to 31 March 2013. We assume the sample period is sufficient enough to evaluate the information asymmetry especially after the huge economic policy changes in Indian economy regarding FDI and domestic investment.

3.4 Tools and techniques: First of all, the descriptive statistics to examine the normality and then the non- parametric test to examine the stationary and randomness of the sample distribution was used.

3.4.1 Unit Root Test

A unit root test tests time series for stationarity and find out whether a time series variable is non-stationary. The most appropriate tests are i.e. the Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) test. Both tests use the existence of a unit root as the null hypothesis. For a non-stationary series, having the first difference of the series stationary, the series contains a unit root.

3.4.2 Run Test

The test is non-parametric and is independent of the normality and constant variance of data. To test and detect the statistical dependencies (randomness) the Run test is used. The null hypothesis of the test is that the observed series is random variable. The null Hypothesis is rejected, when the expected number of runs is significa9ntly different from the observed number of runs. The test statics is:

$$Z = \frac{(R-\bar{R})}{SR}$$

where ,R is the observed number of runs, $\bar{R}$ is the expected number of runs, and S_R is the standard deviation of the number of runs. The values of R and S_R are computed as follows:

$$\bar{R} = \frac{2n_1n_2}{2} + 1$$

$$s_R^2 = \frac{2n_1n_2(2n_1n_2 - n_1 - n_2}{(n_1+n_2)^2(n_1+n_2-1)}$$

Where, n_1 and n_2 are the number of positive and negative values in the series.

3.4.3 Kolmogorov-Smirnov (KS) Test

KS Test is a widely used goodness of- fit tests. It compares the observed cumulative distribution function for a variable with a specified theoretical distribution which may be uniform ,normal, exponential or Poisson. It test whether the observations have come from the specified distribution.

4. RESULTS AND DISCUSSION:

4.1 Descriptive Statistics

The values of skewness for S&P CNX Nifty and CNX Nifty Junior are 0.95 and 0.86 respectively and the values of kurtosis are 2.72 and 3.02 respectively (Table 1), suggesting that the stock returns are not normally distributed, and that is also verified with the Jarque-Bera statistic test for testing whether the series is normally distributed or not. The hypothesis of normal distribution is rejected at the conventional 5% level. Further, for exploring evidences to explore whether the sample distribution conforms to a normal distribution or not non-parametric tests have also been conducted.

Table 1: Descriptive Statistics

Variables	S&P CNX NIFTY	CNX NIFTY JUNIOR
Mean	2330.43	4236.74
Median	1756.05	3529.48
Maximum	6287.85	13069.45
Minimum	854.20	1046.70
Std. Dev.	1390.82	2699.14
Skewness	0.95	0.86
Kurtosis	2.72	3.02
Jarque-Bera	341.89	272.06
Probability	0.00	0.00
Observations	2214	2214

4.2 Unit Root Test

It appears from the Table 2, the null hypothesis that there is a unit root cannot be rejected for both S&P CNX Nifty and CNX Nifty Junior, on the basis of intercept terms in the test equation in the level form. But contrariwise, in case of the first differences of both S&P CNX Nifty and CNX Nifty Junior, the null hypothesis regarding a unit root is strongly rejected. Hence, it can be said that both S&P CNX Nifty and CNX Nifty Junior have a unit root, that is, non-stationary at their level forms, but found stationary in their first differenced forms. Based on unit root tests, it may be concluded that indices S&P CNX Nifty and CNX Nifty Junior show signs of random walk.

Table 2: Unit Root Test

Augmented Dickey-Fuller (ADF Test)

Indices	Level			First difference		
	Lag length	ADF statistic	p-value	Lag length	ADF statistic	p-value
S&P CNX NIFTY	1	-0.951682	0.7719	0	-43.54857	0.0000
CNX NIFTY JUNIOR	4	-1.020728	0.7479	3	-24.97506	0.0000

Exogenous: Constant

Lag Length: Automatic based on criteria: SIC, MAXLAG=25

*MacKinnon (1996) one-sided p-values.

Deterministic terms: Intercept

Phillips-Perron Test

Indices	Level			First difference		
	Bandwidth	P-P test Statistic	p-value	Bandwidth	P-P test statistic	p-value
S&P CNX NIFTY	9	-0.923302	0.7813	12	-43.4518	0.0000
CNX NIFTY JUNIOR	7	-1.052915	0.7360	13	-39.54452	0.0000

Exogenous: Constant

Bandwidth: Neweywest using: Bartlett kernel

MacKinnon (1996) one-sided p-values

Deterministic terms: Intercept

The critical values from MacKinnon (1996) for rejection of H_0: intercept	1% level	-3.43329
	5% level	-2.86273
	10% level	-2.56745

4.3 Run Test

The test is non-parametric and is independent of the normality and constant variance conditions. The Run test is used to test and perceive statistical dependencies (randomness). The null hypothesis of the test is that the observed series is random variable. If the expected number of runs is significantly different from the sum of observed runs, the test rejects the null hypothesis.

Table 3 displays the results of the runs test. It can be seen that the total number of runs are 8 and 15 for S&P CNX Nifty and CNX Nifty Junior respectively. It also indicates zero observed significance level. Hence, the randomness hypothesis for both the series is rejected.

Table 3: Run Test

Description	S&P CNX Nifty	CNX Nifty Junior
Test Value *	1756.05	3529.475
Cases < Test Value	1107	1107
Cases >= Test Value	1107	1107
Total Cases	2214	2214
Number of Runs	8	15
Z	-46.7662	-46.4686
Asymp. Sig. (2-tailed)	0	0

* Median

4.4 Kolmogorov-Smirnov (KS) Test

KS Test is a widely used goodness of- fit tests. It compares the observed cumulative distribution function for a variable with a specified theoretical distribution which may be normal, uniform, exponential or Poisson. It test whether the observations have come from the specified distribution.

For the present series, we assume that sample behave like a normally distributed series. The results of KS results indicate a 0.00 probability for the Z at the 5 per cent level (Table 4). Null hypothesis of normal distribution for S&P CNX Nifty and CNX Nifty Junior is therefore rejected.

Table 4: Kolmogorov-Smirnov Test

Decision Parameters	Results	S&P CNX Nifty	CNX Nifty Junior
Most Extreme Differences	Absolute	0.1777	0.1187
	Positive	0.1777	0.1113
	Negative	-0.1491	-0.1187
Kolmogorov-Smirnov Z		8.3590	5.5886
Asymp. Sig. (2-tailed)		0.00	0.0

Test distribution is Normal

5. CONCLUSIONS AND POLICY IMPLICATIONS:

The hypothesis of normal distribution is rejected at the conventional 5% level. The Kolmogorov Smirnov Goodness of Fit Test (KS) shows 0.00 probabilities for the Z at the 5 percent level of significance. Null hypothesis of normal distribution for S&P CNX Nifty and

CNX Nifty Junior is rejected. Apart from this, it can be said that both S&P CNX Nifty and CNX Nifty Junior have a unit root, that is, non-stationary at the level forms, but stationary in the first differenced forms. Based on unit root tests, it may be concluding that indices S&P CNX Nifty and CNX Nifty Junior show signs of random walk. It can further be seen that the total number of runs are 8 and 15 for S&P CNX Nifty and CNX Nifty Junior respectively. It also indicates a zero observed significance level. Consequently, the randomness hypothesis for both the series is rejected. We finally concluded that Indian Stock markets do not exhibit weak from of market efficiency. This is important because the efficiency of a market in processing information affects its allocated capacity, and therefore its contribution to economic growth. Furthermore, our results show that the behaviour of equity market returns and the associated volatility are dissimilar. This may have implications for portfolio diversification and risk management strategies. In particular, these results may be useful to investors given that price volatility is an important driver of active investment returns; and, volatility is also a key determinant of risk premium in equity markets. In terms of policy implications, the rejection of the market efficiency hypothesis implies that addressing trading frictions; promoting timely disclosure and dissemination of information to investors on the performance of listed companies; and strengthening regulatory oversight are key elements of a strategy aimed at improving the efficiency of the capital.

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