An Econometric Approach To Test The Weak Form Of Efficiency Of Indian Realty Sector

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Abstract

The paper is an attempt to test the randomness of return series of Nifty realty index and the individual stocks listed in the index during the study period. This is in order to test the efficiency of the most fragile industry of the Indian economy during the period of major macro-economic events such as, Pandemic, lockdown, raising inflation rates and so on. Indian realty industry hit very badly due to global turmoil in the last couple of years. Keeping in view the role of Indian realty industry that contributes approximately 13% to country's GDP the study is sets out an effort to understand the efficiency of Indian realty index and the companies listed continuously under the index during the study period. The study is unique of its kind in the area of capital market analysis as study on sector specific indices are quite a few in number and at the same time the paper strive to make an effort to use various econometric tools such as Augmented Dickey Fuller(ADF) test, Ljung- Box Q-statistic and non-parametric Runs test in order to test the hypothesis.The tests applied in the paper are gaining popularity in the area of financial analysis as they are believed to produce more accurate and reliable outputs over conventional tools/ tests. The results of the study indicate there is serial independence among the return series during the study period thus confirming the existence of weak form of efficiency. I.e., the industry/firms absorbed information swiftly and reflected that in the prices instantly thus making the scope of earning abnormal returns nearly impossible.

Key Words: Nifty Realty, Log returns, market efficiency, pandemic.

JEL Classification: G140(Information and Market Efficiency, Event Studies, Insider Trading), G120.

I. Introduction

Ever since the capital markets are perceived as instruments for financial intermediation there is a need for continuous monitoring of the performance of the markets in order to understand the co-movement of markets and information. The studies conducted on capital markets by King and Levine 1993a and 1993b; Beck, Levine and Loayza 2000; Levine, Loayza and Beck 2000 further emphasized on the association between capital markets and economic development. In views of many academicians

and economists the role of an efficient capital market is indispensible in right channelizing the domestic/ household funds of an economy.

Every economy for its growth and development in terms of GDP, National income and standard of living relies heavily on the financial sector which plays an active role in channelizing funds from domestic/ house hold sources, overseas sources to various industrial projects or business ventures and capital markets are the vehicles through which the entire process of channelization takes place.

The literature in the area of capital markets and financial development claims to be linked to proportion of savings that can be mobilized from retail investors and the efficiency of capital markets in investing such mobilized savings in capital markets. For promoting an efficient capital market the countries must strive to create an eco-system that links net savers and net borrowers while prioritizing liquidity, promising returns and divers-ability to funds. For attaining afore stated the markets needs to be informational efficient I.e., As stated by Fama(1970) a market to be informationally efficient

must incorporate all available information in their prices instantaneously.

Also an efficient and liquid capital market must be perceived as an avenue for long-term funds while keeping a check on the transaction costs and the risks of uncertainty. A poor or underdeveloped capital market may influence the investor's sentiments and also the costs of investment such as, transaction costs and so on may shoot up due to faulty mechanism and improper management. Thus, it is advised to the economies to have a robust capital market structure to be laid down in order to attract more household investments.

Further, in the works of Osaze(2000), it is mentioned that an efficient capital market is necessary for long-term growth and capital formation. Following the lead many other researchers viz. Ekineh(1996), Ekundayo(2002) claimed that capital markets are the means of channelizing funds from surplus economic units to deficit units and emphasized on the need for more funds accumulation to build a stable and sustainable economy. Moreover, the earlier studies on capital markets and their functioning have proven that a

well-organized capital market creates more and profitable investment opportunities for the investors and provides liquidity, profitability and risk-diversification to the investors. (Anyanwu,1998).

By scrutinizing the earlier studies on capital markets and their role in an economy's growth and development we believed to conduct a study on market efficiency which would be of an immense assistance to technical analysts in right-sizing their portfolios as per the information absorption rate and speed of an industry or the market as a whole.

For conducting the study on Indian realty industry and the listed company under the sectorial indices we segregated the entire paper in to sub-sections as mentioned, Section I Introduction, Section II Review of literature, Section III Research Methodology, Section IV Empirical results, Section V Limitations and Section VI Scope of the study respectively.

II.   Review Of Literature

The immense literature available on capital market's role in economy's development is dated back to 1912 when Joseph Schumpeter mentioned in his works that a country's financial development

promotes right channelization of funds from surplus sources to entrepreneurs with reasonable or lofty returns. However, the slew of studies in the area are initiated by Goldsmith(1969) whose work is on understanding the correlation between financial development and economic development. Later studies on same course are conducted by McKinnon and Shaw in 1973.

Ever since the idea of association between economic and financial development is been brought to light the study of capital markets and their magnitude of efficiency has become a debatable and researchable area. The earlier researches in the area by Greenwood and Jovanovic(1990);Levin(1996); Jbill, Enders, Treichel(1997) are theoretically strong but lack analytical rigor. However, the studies conducted in 20th century by Sarkar(2006), Agarwal(2000)(2008), Jacque(2001), Tufano(2003), Chou(2007), Deb and Mukharjee (2008),Chakraborthy(2008) et.al laid foundations for strong analytical models for analysing the financial markets as well as quantifying the association between financial and economic development.

This raising focus on economic and financial development set the plethora for the concept of market efficiency. The first ever study on testing of market efficiency is given by Fama(1965) whose works in the area are revered till date. His works on efficient market hypothesis (EMH) are the basis for testing the efficiency of capital markets which are growth engines for financial and economic development. In words of Fama(1970), capital markets are claimed to be efficient if the rate of information absorption by the markets is swift and spontaneous. The swift absorption of information by markets characterizes their ability to return to the state of equilibrium at the earliest after any sort of structural break.

An array of studies on market efficiency are conducted on many developed and developing capital markets ever since. Few of the remarkable studies in the area include, Conard and Juttner (1973), Cooper (1982), Barua (1987) and Chan, Gup, and Pan (1992),Bulter&Malaikah (1992),Frennberg and Hansson (1993) , Barnes (1986), Abeysekera (2001), Gradojevic, Djakovic, and Andjelic (2010) and so on. However, the studies confining to a particular sector/industry are pretty rare and especially the studies of this sort on Indian capital markets are quite a few. Perhaps, at times like this where the world is going through a cumbersome period a study of this sort is quint essential.

III.   **Research Methodology :**
The methodology of the study includes, Research Problem, Objectives of the study, Hypothesis, Period of the study, Data collection methodology, econometric and statistical tools used.

A. *Research Problem:* Indian realty sector is one of the worst hit sectors due global pandemic and subsequent lock-down enforcements in the country.Despite recovery the industry continue to be fragile due many post-traumatic factors that have caused huge amounts of wealth erosion. Considering the volatility in the industry for the last couple of years the present study would test the efficiency of realty industry amid pandemic and the subsequent micro and

macro-economic events.

B. *Objectives of the study:* The study is conducted to fulfil the below mentioned objectives,

i. To understand the information impact on Indian realty sector.

ii. To elaborate on the impact of an uncertain event on a booming industry (Realty) of the country.

iii. To examine the information absorption and reflection rate of realty sector.

iv. To provide an understanding on the industry's responsiveness to short-run events of this (Covid) sort which would educate both the investors and the technical analysts.

The pre-conditions for claiming a market to be efficient in weak form are,

Condition 01: Return series must follow normal distribution.

Condition 02: Return series must be non-stationary

Condition 03: Serial correlation must not exist.

Condition 04: Return series must be random.

C. Data:

To conduct the study Nifty realty and nine companies listed in the index continuously for the study period are chosen. The daily closing prices of all trading days for the study period are collected from **www.bseindia.com** and **www. nseindia.com.**

D. Period of the study :

The period of the study is confined to the duration of 24th March,2020 to 24th March 2022 covering a span of two years. Also 24th March,2020 is the day on which nation- wide lockdown is enforced in the country. The period is unique as the post lock down period is characterized by many structural breaks such as, high inflation rates, decline in consumption expenditure, increased unemployment rate and the most recent Russia-Ukraine war and so on.

E. Hypothesis:

Null Hypothesis-H0: TheIndex/Security Indices follow a random walk during the Study period.

Alternative Hypothesis-H1: TheIndex/Security Indices doesn't follow a random walk during the Study period.

F. Methodology:

The methodology of the study involves testing the weak form of efficiency of the indices and securities as proposed by Fama(1970). For conducting the same the daily closing prices are collected and log returns for the same are calculated using the formula,

$$R_{i,t} = \log (I_t/I_{t-1})$$

Where, I_t- Current day closing value,

I_{t-1}- Previous day closing value.

To test the weak form of efficiency we use an array of econometric and parametric tests such as, serial correlation test, Augmented Dickey Fuller(ADF) test and non-parametric run test are used.

i. **Serial Autocorrelation test:** Serial correlation quantifies the interdependence among time series data. The time series data in this case are the log returns of different lags on which the Ljung and Box's (1978) Q-statistic is applied. The Q-statistic is computed using,

$$Q = \frac{n(n+2)\sum_{k=1}^{m}\frac{\rho 2}{n-k}}{}$$

Where, n= Total number of lagged observations, m- Time lag length

The test follows chi-square distribution($\chi 2$).

ii. **Run Test:** Run test investigates whether successive price changes of time series data are independent or not. Here returns of present day are compared with previous returnsand based on the change in the prices on successive days signs are been assigned.. The data is reorganized based on signs and average returns of bundled data are computed and then a comparison between average and actual returns are made randomly. The formula for calculating expected returns is given by,

$$Expected\ Return = U(U-1) - \sum_{i=1}^{3} si^2 \Big/ U$$

Where, U=Number of runs, si= Number of sign changes

The expected return series in general for large samples approaches normal distribution,hence we apply Z-test.

iii. **Unit Root Test**: To test the stationarity property of return series we use Augmented Dickey Fuller(ADF) test. The works of Hassan, Shoaib, and Shah (2007) claims that in order for a market to be efficient return series must be non-stationary I.e., series must be random and to administer

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the ADF test we use the below mentioned regression equation,

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \delta_2 \Delta y_{t-2} + \ldots + e_t$$

IV. Empirical Results

From table I, it is evident that all security/index mean returns are fluctuating nearly at the same rate. This depicts that both index and security returns for the study period are equally riskier. Besides the values of skewness are positive for all except for Nifty realty and DLF Ltd., I.e., both these have longer left tails. Similarly, the kurtosis figures are all positive Nd greater than three indicating that all the securities and index are leptokurtic.'

Further, the values of Jargue-Bera test are far from zero indicating non-normality of return series. Thus, from the values of skewness, kurtosis and Jargue-Bera test statistic values the distribution is non-normal. The condition 01 of weak form of efficiency is failed in case of index and security returns.

From table II ADF t-statistic values it is evident that for all the securities and index t-statistic values are greater than critical value at 5% and the probability value(p-value) is less than significance value(α) we reject null hypothesis of non-stationarity. From ADF values the condition 02 of weak form of efficiency also been rejected.

Further the values of Ljung-Box Q-statistic are different from zero indicating the non-existence of serial correlation in the data. The return series for the study period are serially independent thus holding the condition three. From table III Run test results it is evident that return series are random as run statistic values are greater than significance value (5%). Hence from run test values we can say that the series is random.

Thus, from the analysis we may conclude that the realty index and the companies listed under are serially independent and random during the study period. Hence, earning abnormal returns is not possible even if the analyst or investor scrupulously study the index movements to various kinds of information during or pre-lockdown period. Hence, we may conclude that the index is efficient in its weak form.

V. Limitations of the study

- Study is conducted only on realty industry.
- The period of study is only a couple of years we may extend the same to long run.
- ADF test with trend and constant is administered however we may apply trend alone and constant alone to know the presence of unit root appropriately.
- However, there are certain other econometric tools such as, Kwiatkowski-Phillips-Schmidt-Shin test, Phillips-perron test and so on that can be applied to test the unit root presence.
- The underlying assumptions of the statistical/econometric tools applied will always be a shortcoming for studies of this category.

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Appendix

Table I Summary Statistics/ Descriptive statistics of Indian Realty Index

	Brigade	DLF	Godrej	India Bulls	Oberoi	Phoenix	Prestige	Sobha	Sunteck	Nifty Realty
Mean	0.0029	0.0021	0.0021	0.0018	0.0016	0.0011	0.0021	0.0032	0.0017	0.0019
Median	0.0010	0.0022	0.0006	-0.0013	0.0003	0.0004	0.0014	7.7901	-0.0005	0.0029
SD	0.0306	0.0298	0.0304	0.0401	0.0303	0.0274	0.0307	0.0338	0.0303	0.0221
Kurtosis	4.4977	4.7356	7.0476	3.9819	6.0359	6.1911	4.2032	5.8282	5.1641	4.6307
Skewness	0.6282	-0.0036	0.1959	0.1933	0.6652	0.0596	0.4573	0.8338	0.6539	-0.1584
Minimum	-0.0934	-0.1254	-0.1554	-0.1617	-0.1229	-0.1265	-0.0974	-0.1077	-0.0891	-0.0779
Maximum	0.1270	0.1097	0.1428	0.1395	0.1608	0.1343	0.1259	0.1752	0.1635	0.0830
Sum	1.4266	1.0507	1.0307	0.8998	0.8268	0.5659	1.0542	1.6165	0.8533	0.9356
Count	498	498	498	498	498	498	498	498	498	498
JB Statistic	79.3005	62.5091	343.1361	23.1058	227.9793	211.5989	47.3952	223.6691	132.6770	57.2603
Probability	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: Author's Compilation

Table II ADF Test statistic Values

Index/Company	*ADF t-statistic*	*Probability Value*
Brigade	-22.4997	0.0000
DLF	-23.5602	0.0000
Godrej	-20.4130	0.0000
India Bulls	-21.2656	0.0000
Oberoi	-20.5267	0.0000
Phoenix	-23.4273	0.0000
Prestige	-21.4446	0.0000
Sobha	-20.9883	0.0000
Sunteck	-20.8269	0.0000
Nifty Realty	-20.7252	0.0000

Source: Author's Compilation

Table III Runs Test

Index/Company	*Runs*	*Z-statistic*	*P-Value*
Brigade	238	-0.977	0.329
DLF	257	0.628	0.530
Godrej	261	1.123	0.261
India Bulls	246	-0.308	0.758
Oberoi	225	-2.170	0.030
Phoenix	264	1.270	0.204
Prestige	218	-2.851	0.004

Sobha	241	-0.588	0.556
Sunteck	249	0.137	0.891
Nifty Realty	226	-2.120	0.034

Source: Author's Compilation

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