



“EMPIRICAL MEASURES OF VERIFYING THE WEAK FORM INFORMATIONAL EFFICIENCY OF MID-CAP SECURITIES IN INDIAN STOCK MARKET”.

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Abstract

The new information to which the investors respond rapidly in the market is created by the efficiency of market, i.e. ability function. Informational efficiency and the analysis on the pattern of series on day-to-day basis of stock price have captured the maximum attention of research area in the field of finance. This research article presents an examination of efficiency of Mid-cap security in Indian stock market in NSE with different indices. It is an attempt to investigate the information efficiency in Mid-cap securities in Indian stock market. The fundamental objective of the study is to verify the informational efficiency of selected indices from NSE - NIFTY Mid-cap 50, NIFTY Mid-cap 100, NIFTY 50. For the purpose of accomplishing the objectives of the current study 3 years of data has been collected from the selected indices of NSE and the time series econometrics tools such as Unit root testing, Random walk modelling, VAR model, Causality model, and impulse response have been applied and results suggests that the Mid-cap securities at Indian stock market are highly inefficient and the price changes are not random.

Key Words: Market efficiency, Mid-cap security, NIFTY Mid-cap 50, NIFTY Mid-cap 100, Random walk model

INTRODUCTION

In an inordinate length of time the study of informational Efficiency has become subject that has higher passionate discussion and arguments among financial experts and researchers. As stated above in the introduction the interrogation of the current investigation efforts to respond to the following question: Do the free flow of information at NSE – NIFTY Midcap 50, NIFTY Midcap 100 and NIFTY 50, are independent and consecutive returns of share price are also independent. As the study intends to substantiate and observe the ability and informational efficiency of Mid-cap security it becomes easy to enhance the hypothetical literatures which make available for experimental proof. The outcome of the study also proposes in providing the cornerstone information to the investors at Mid-cap security so as to realise the returns as they are highly unpredictable and highly fluctuating, in time bound at NSE. The study is not only confined to the Academicians and investors, but it is favourable and constructive to the players, regulatory authorities in making out the framework which gears in helping the market towards evolving. The benefit of the results enables the fund manager to offer the suggestion to investors that how to capitalise their investment with price drive and frequent information available. The research insight and contributes in extending the awareness and recommending unexplored zones for further studies. Mainly, Predicting or discovering stock price and analysing the efficiency of market has become a hot cake to researchers, meanwhile this has lead to enormous favourable contribution towards the development. The current study provides a good insight to researchers, scholars, academicians to identify the efficiency of market through various approaches. It also aims in adding the quality justification for the existing body of knowledge and explores unseen dimensions for further research of informational efficiency of Mid-cap securities.

Efficient Market Hypothesis – EMH

Market efficiency is nothing but the level or the degree of efficiency a market attains due to continuous flow of information and the changes of share price due to the effect of information, hence it is always referred to information efficiency. In Modern financial theory 'Efficient Market Hypothesis - EMH' is always considered as cornerstone as it is extremely indefinite and mostly debated subject. Efficient Market hypothesis is a theory propounded and developed by a well-known economist Eugene F. Fama. Eugene F. Fama every so often was considered as the Father of Efficient Market Hypothesis (EMH) and was broadly known as the Father of Modern Finance. In 1970, his theory strongly expressed that investor alone cannot beat the market and non-existence of anomalies as they will be arbitrated. It is a theory of investment basically expressed the reflection of price value of the share due to the flow of continuous information in the market. Practically EMH at all times tends to subject matter of trends predictability and stability of stock price and proved futile. But both the analysis of fundamental and technical failed to produce. According to the EMH, stocks always trade at their fair value on stock exchanges, making it impossible for investors to either purchase undervalued stocks or sell stocks for inflated prices. As such, it should be impossible to outperform the overall market through expert stock selection or market timing, and the only way an investor can possibly obtain higher returns is by purchasing riskier investments.

The concept of informational efficiency and its study itself is very important as it brings the idea of understanding the changing situation due to the flow of information in market and making right choice in dealing with them. Due to the large changes of information flow and its influence on investors, there should be a track on the information that hits in the market and sound knowledge for making investment decision. This decision-making process needs the support of past and present knowledge of market and its performance. The sensible act of choosing the right action needs strong evidence from the continuous research.

Informational Efficiency of Mid-cap security in Indian stock market

As mentioned above efficiency market and its study has never been a new field of research in finance. Over decades the efficiency market is studied from all perspective and tremendous contributions towards the growth have been made. In Indian stock market the study was so far was focused narrowly on large-cap securities in whereas a smaller amount of attention was given to the Mid-cap securities [Mid-cap security are those falls under the category of Mid-sized capital structured companies operates in the stock market]. With help of reviews it has been clear that, though there are several measures and approaches available to check the performance of Mid-cap securities the attempt is very less. So, in this scenario verification on the informational efficiency of Mid-cap securities remain untouched and hence it invites huge opportunities for the research. Hence the area requires the effort to find whether the information ability has strong influence in fluctuations and change in price of stock, do Large-cap securities has dependency on Mid-cap securities or do Mid-cap security alone has complete influence on market fluctuations?

In consideration with the above unexplored or semi explored area the need to recognize the ability of Mid-cap security market arises. This study aims at providing the statistical input to understand the Mid-cap security market environment and predicting the market sensibly. In this context the current study focuses on identifying whether the Mid-cap securities in Indian stock market have weak form of information efficiency or not. To detect this efficiency the present study involves various approaches. The current research intends to enable Mid-cap security investor of Indian stock market in providing basic necessary evidence in analysing the market efficiency.

Review of Literature

Several studies from numerous scholars have been taken place so far on EMH and its different form i.e. Weak, semi-strong and strong form. Though the outcomes were multifaced and lead to huge confusion the study went on over the decades with the application of traditional to latest version of models' range. It was also considered in one of the EMH study which resulted that Indian capital market is a form of weak efficient market which was rejected by others.

The basis for the EMH can be found in early 19th century in ph.d thesis "the theory of speculation" of **Louis Bachelier**. In his dissertation he tried to express that the random walk followed the series of stock price and proved through his dissertation that the unpredictable price pattern by evidencing the randomness of stock price. **Eugene F. Fama (1960)** studied on the same area deeply and examined in his Ph.D. research, he found that information available in the market and which already has been incorporated will be reflected in the prices of security and hence it is pinpoint that market cannot be defeated. He also stated that there is no point in predicting the future price on the basis of technical and fundamental analysis. **Sharma and Kennedy (1977)**, made a behavioural comparative analysis between New York London, and Bombay stock indices with applications of spectral analysis and runs test during 1963-72 and ensured that these stock exchanges had random movement. It was concluded that the weak form of Efficient Market Hypothesis (EMH) was supported by the market as it was followed by the random walk. **Yalawar (1988)**, studied on efficiency of 122 stocks listed on BSE and found the presence of randomness in stock prices behaviour by using non-parametric tests, Spearman's rank correlation test. **Gupta O.P (1990)**, from 1979 to 1987 made an empirical studied on efficiency of Indian Stock Market. Indian share price behaviour was tested by applying the weak variant of EMH and Random Walk Hypothesis and also employed Serial Correlation and Runs Test, and both the test resulted independent movement of stock price. **Sarkar N. and Mukhopadhyay D. (2003)**, attempted an empirical evaluation to recognise stock market inefficiency in Indian stock market by employing various test on BSE 100, S&P CNX Nifty, DOLLEX indices. They found that the efficiency that occurred in the Indian Stock Market is due to Serial Correlation, non-linear dependence, day-of-the-week-effects, parameter instability, Generalised Autoregressive Conditional Heteroscedastic (GARCH) Model, daily level seasonality in volatility and call money rate. **Pandey Anand (2003)**, by applying runs and Auto Correlation Function ACF (K) test tried to found efficiency level and randomness of Indian stock market from January 1996 to June 2002 and concluded that stock indices series were random time series confirming the Random Walk Theory. **Kaur Harvinder (2004)**, examined volatility of stock market by considering BSE (Bombay Stock Exchange) and NSE (National Stock Exchange) and tried to reveal that Indian stock market during 1992 faced a huge volatility and had a fall up to 1995. They concluded that the Indian stock market had high volatility. **Singh Rohini et. al. (2005)**, examined market efficiency on the returns of portfolios of mutual funds

which was constructed randomly on selected stock indices CNX MID-CAP 2000, CNX 100 and CNX MID-CAP for the period of five years (2003 to 2007) had employed t test and found strong form of efficiency market hypothesis. **Verma Asutosh (2006)**, through Serial Correlation Test and Runs test attempted an investigation to evaluate efficiency of the selected indices in BSE from the period 1996 to 2001 and revealed that that the prices of the stock were in series and the companies under BSE sensenx was not weak form efficient whereas in 1998-99 it faced pretty weak form efficient. **Iqbal and Mallikarjunappa, T. (2007)**, with the application parametric and non-parametric tests attempted to identify the reaction of market after announcing the quarterly earnings of 149 companies listed under BSE and noticed that 5% level of importance at runs test during event window which resulted irregularities returns. Hence during this irregular return there is always an advantage for investors to earn abnormal returns. The conclusion from the study was efficiency of semi-strong form of Indian stock market is low.

3. Objective of the Study

- To verify the weak form informational efficiency of selected indices of Mid-cap security in Indian stock market.
- To examine the sensitivity of chosen indices series

4. RESEARCH METHODOLOGY

The research adopted in the current study is empirical in nature. In order to enable the convenience of randomness of stock price and determine the information ability at selected indices of Mid-cap security of NSE in Indian stock market. It encompasses the test in trading of stock prices at selected indices of NSE, study intends to test & verify whether every day sequential price and its changes are random or not. The Empirical study is constructed on base of historical price provided at NSE the secondary data was obtained and considered for the further statistical test. The quantitative data of past has huge dependency and always utilized for the research and development in stock market. The study is confined to 5 years of data i.e., from January 1st 2014 to October 31st 2019 which was extracted from selected indices of NSE. The main intention of adopting the current method is to suit the extracted and targeted data from NSE. Every day closing value of NIFTY Midcap 50, NIFTY Midcap 100, NIFTY 50 mentioned under Midcap security NSE of Indian stock market were considered for the test.

Statistical tools applied

The empirical research involves the statistical approaches to test the data obtained, the several test to determine whether the prices follow random walk or not have been used in this paper namely – Runs Test, Variance Ratio Test, BDS Test, Auto Correlation Function Test.

Summary of statistical approaches selected for the study.

RUNS TEST

The runs test (**Bradley, 1968**) the statistical approach utilized in-order to identify and make a decision regarding the randomness of a series of data which should be either increasing values or of decreasing values which is present in the length of the run.

According to Fama (1965) the test which enables to express the successive sequence among the series is runs test. This is adapted due to verify the randomness to the generated series.

$$E(R) = \mu_r = \frac{2 n_1 n_2}{n_1 + n_2} + 1 \quad \dots\dots\dots(1)$$

Where n_1 and n_2 are the runs of the price changes of each sign. The variance of $E(R)$ is

$$\sigma_R^2 = \frac{2 n_1 n_2 (2 n_1 n_2 - 2 n_1 - n_2)}{(n_1 + n_2)(n_1 + n_2 - 1)} \quad \dots\dots\dots(2)$$

The actual runs represented by R is then subjected to Z test as follows

$$Z = \frac{R - \mu_R}{\sigma_R} \quad \dots\dots\dots(3)$$

The Z value is then used to verify whether the difference between the actual runs and expected runs is statistically significant or not. If the null of no difference cannot be rejected than we can conclude that the returns are independently distributed and if the null of no difference is rejected then we can conclude that the return sequence is not independent and random, hence there may be significant correlation in the past prices

VARIANCE RATIO TEST

In 1988 the two statistical tests was proposed by Lo and Mac Kinlay in order to examine variance ratio

$$\begin{aligned}
 V(k) &= \frac{Var(x_t + x_{t-1} + \dots + x_{t-k+1})/k}{Var(x_t)} \\
 &= \frac{Var(y_t - y_{t-k})/k}{Var(y_t - y_{t-1})} = 1 + 2 \sum_{i=1}^{k-1} \left(\frac{(k-i)}{k} \right) \rho_i
 \end{aligned}
 \tag{4}$$

Indications:

ri = i-th lag autocorrelation coefficient of {xt}.

V(k) = particular linear combination of the first (k-1) autocorrelation coefficients, with linearly declining weights.

VR test as a specification test of H0: r1 = ... = rk = 0, i.e., returns are serially uncorrelated A test can be constructed by considering statistic based on an estimator of V (k)

$$VR(k) = \frac{\hat{\sigma}^2(k)}{\hat{\sigma}^2(1)}
 \tag{5}$$

BDS TEST

BDS test verifies the non-linearity and i.i.i. increments in the given time series.

AUTOCORRELATION FUNCTION TEST

The autocorrelation function (ACF) test is to recognise the frequency of autocorrelation among the time series to, ACF test enables to value the current and lagged observation among the correlation of return among ETF of the time series

$$P_k = \frac{\sum_{t=1}^{n-k} (RETF_t - \bar{RETF})(RETF_{t+k} - \bar{RETF})}{\sum_{t=1}^n (RETF_t - \bar{RETF})^2}
 \tag{6}$$

5) PRESENTATION AND DISCUSSION OF RESULTS

Results of the data analysis and tables.

5.1 RANDOM WALK MODEL FITTING

Firstly, to explaining the behaviour of the prices the study adopted random walk method and examined whether random walk model's suitability for the test. Random walk here means the changes that happens in the prices that solely depend only on its past prices and the random shocks that happens in the market.

5.1 Dependent Variable: NIFTY Mid-cap FIFTY

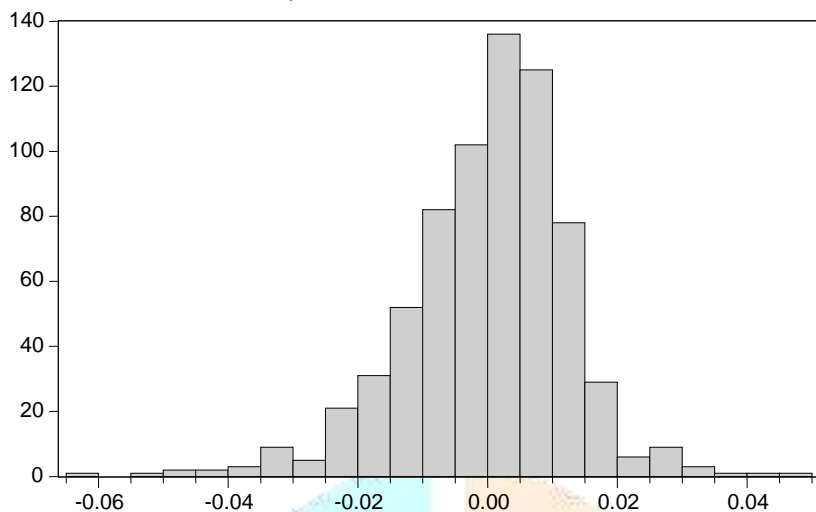
Table-01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.026341	0.021797	1.208462	0.2273
LNONMF(-1)	0.996903	0.002606	382.5318	0.0000
R-squared	0.995253	Mean dependent var		8.362394
Adjusted R-squared	0.995246	S.D. dependent var		0.183425
S.E. of regression	0.012647	Akaike info criterion		-5.899902
Sum squared resid	0.111647	Schwarz criterion		-5.886899
Log likelihood	2066.966	Hannan-Quinn criter.		-5.894875
F-statistic	146330.6	Durbin-Watson stat		1.896024
Prob(F-statistic)	0.000000			

5.1 a Residual Diagnostics

Table-02

(i) Test of normality



Series: Residuals	
Sample 1/04/2016 10/31/2018	
Observations 700	
Mean	-2.02e-15
Median	0.001234
Maximum	0.045763
Minimum	-0.060503
Std. Dev.	0.012638
Skewness	-0.651084
Kurtosis	5.116785
Jarque-Bera	180.1456
Probability	0.000000

Fig-01

Table-03

(ii) Test of autocorrelation

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.872687	Prob. F(2,696)	0.4183
Obs*R-squared	1.751014	Prob. Chi-Square(2)	0.4167

Table-04

(iii) Heteroskedasticity Test: ARCH

F-statistic	23.93478	Prob. F(1,697)	0.0000
Obs*R-squared	23.20656	Prob. Chi-Square(1)	0.0000

5.2 Random walk model

Table-05

(i) Test for NIFTY Mid-cap 100

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.032496	0.024191	1.343299	0.1796
LNONMH(-1)	0.996692	0.002489	400.4851	0.0000
R-squared	0.995667	Mean dependent var		9.719328
Adjusted R-squared	0.995661	S.D. dependent var		0.160580
S.E. of regression	0.010578	Akaike info criterion		-6.257242
Sum squared resid	0.078101	Schwarz criterion		-6.244239
Log likelihood	2192.035	Hannan-Quinn criter.		-6.252216
F-statistic	160388.3	Durbin-Watson stat		1.785024
Prob(F-statistic)	0.000000			

Table-06

(ii) Test of ACF

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob	
. *	. *	1	0.105	0.105	7.7067	0.006
. .	. .	2	0.017	0.006	7.9028	0.019
. .	. .	3	0.031	0.029	8.5701	0.036
. .	. .	4	-0.049	-0.056	10.284	0.036
. .	. .	5	0.006	0.016	10.307	0.067
. .	. .	6	-0.015	-0.017	10.460	0.107
. .	. .	7	0.001	0.008	10.461	0.164
. .	. .	8	-0.012	-0.016	10.557	0.228
. .	. .	9	0.025	0.031	10.998	0.276
. *	. *	10	0.104	0.097	18.652	0.045
. .	. .	11	-0.004	-0.024	18.664	0.067
. *	. *	12	0.116	0.117	28.352	0.005
. .	. .	13	-0.013	-0.044	28.482	0.008
* .	. .	14	-0.071	-0.057	32.139	0.004
. .	. .	15	-0.001	0.002	32.139	0.006
. .	. .	16	-0.037	-0.021	33.103	0.007
. .	. .	17	0.011	0.016	33.185	0.011
. .	. .	18	0.027	0.024	33.709	0.014

Table-07

(iii) Residual diagnostics

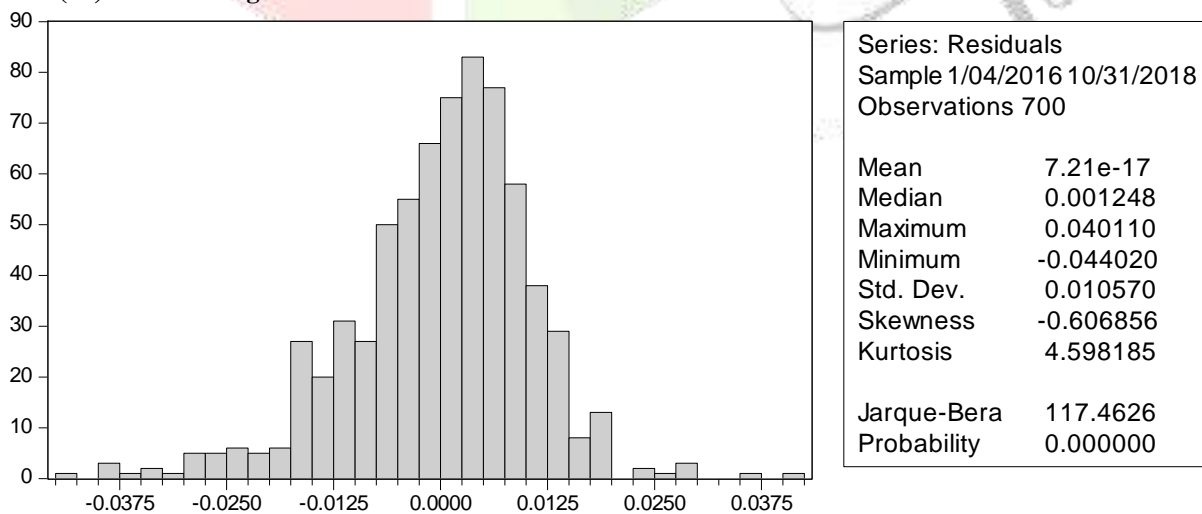


Fig-02

Table-08

(iv) Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.905980	Prob. F(2,696)	0.0206
Obs*R-squared	7.769649	Prob. Chi-Square(2)	0.0206

Table-09

(v) Heteroskedasticity Test: ARCH

F-statistic	33.76009	Prob. F(1,697)	0.0000
Obs*R-squared	32.29282	Prob. Chi-Square(1)	0.0000

5.3 RUNS TEST

Secondly, to measure the weak form of informational efficiency and to determine the randomness of the series, the study further selected the approach called runs test. Series randomness here refers to the changes of prices which took place that have randomly occurred or occurred with no random. In other words, the series in its occurrence has dependency or is purely independent in its appearance. The current test also aims in finding whether there is a strong cause that has happened or there is a strong cause that is happening. If the market is efficient then the price changes will always be random. If the market is inefficient the price changes will not be random and will always be influenced by some other variables.

5.3 (i) RUNS TEST RESULTS

Table-10

mean	0.000442	0.000341
n1	389	379
n2	312	322
n	701	701
ar	320	306
er	347.271	349.1826
var	171.0345	171.4436
sd	13.07802	13.09365
z	2.085258	3.297981
p	0.037046	0.000974

Expected runs (er) are something that is obtained if price changes are random in nature. If the data is random then there is an expected random, which we suppose to attain. When er and ar (Actual runs) are considered they examined statistically and compared to identify whether there is any significance or not.

If null hypothesis says $ar = er$ that = 0 then the process is random.

If $ar \neq er$ statistically then the null hypothesis will be rejected.

The deciding factor here is **p** value. If **p** value is above 0.05, the null is accepted, which means there is no difference between ar and er. However, the results that we have arrived say **p** value is 0.00, that clearly says for three data from NIFTY Mid-cap, NIFTY Mid-cap 100, NIFTY FIFTY it is evident that null hypothesis is rejected. Hence, based on runs test we can conclude that all these indices (variables) fail to accept the null. In runs test the series is random as the null is rejected in both the cases. This is because the P value of runs test for both the series is below 0.05. Considering the above input both the cases null is rejected which means the series is not random. It is evident that the market is not efficient. Since the null hypothesis is rejected the current test concludes that price is not random.

Further these series were subjected to VAR analysis and under the VAR methodology, variance decomposition model was applied and the results are as under.

5.3 (ii) Variance Decomposition Model

Response to Cholesky One S.D. Innovations ± 2 S.E.

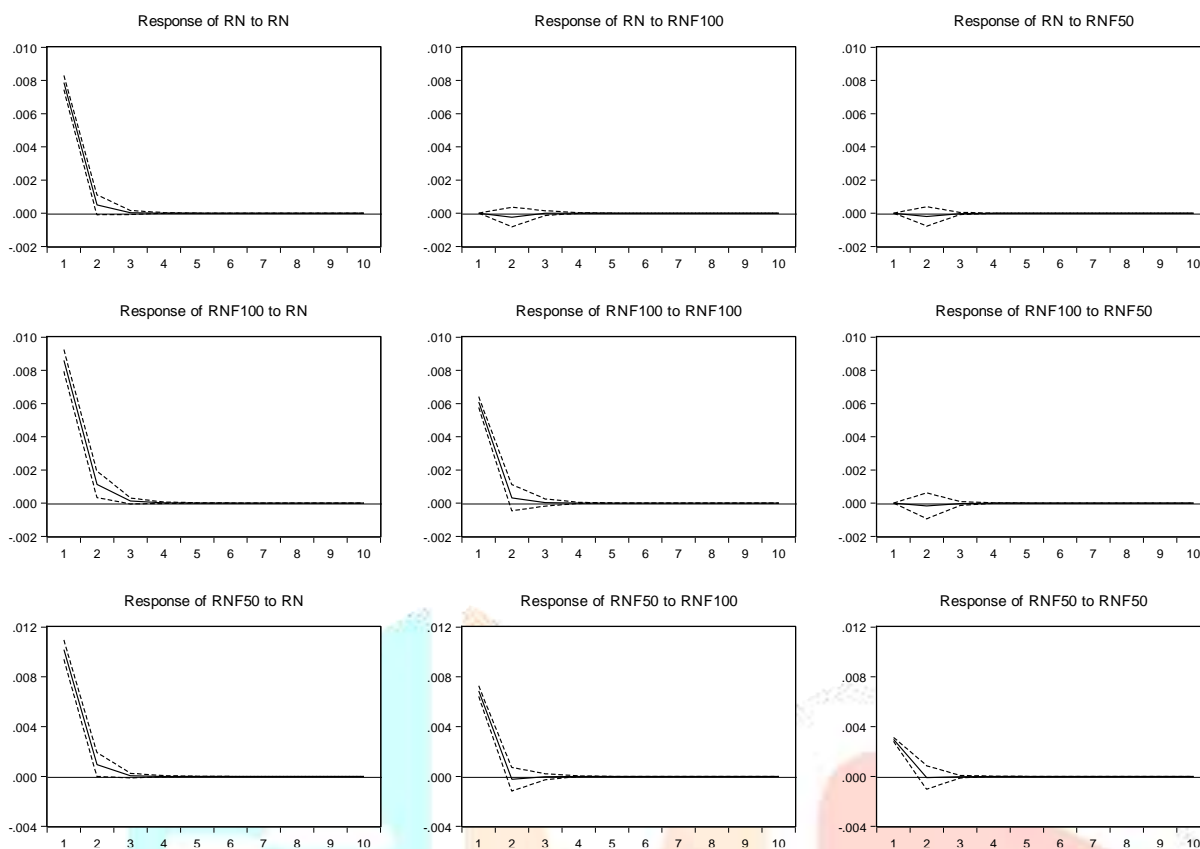


Fig-03

The results clearly suggest that there is significant impact of NIFTY FIFTY on all these stocks where as there is no cross correlation between these series. Responses of NIFTY FIFTY 100 - NIFTY FIFTY is high but the remaining are low. Though there is a significant impact of the news of NIFTY FIFTY on large market movements of Mid-cap securities, the shocks are adjusted rapidly which shows that the Mid-cap market are leading towards efficiency.

5.4 BDS TEST

The term martingale means fair game, under fair game the prices are arranged in such a way where there is absolutely no correlation between the past prices and present prices and it would be completely impossible to predict the future price. When a series has this property, the series is called Martingale. In other words, Martingale is a longstanding word given for random walk. So BDS test verifies whether the series follows the random walk or not.

5.4 (i) BDS Test for NIFTY Mid-cap 100

Table-11

Null Hypothesis: Log LNNMH is a martingale

Joint Tests	Value	df	Probability
Max z (at period 2)*	7.052813	244	0.0000

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.555489	0.063026	-7.052813	0.0000
4	0.284921	0.102646	-6.966487	0.0000
8	0.145107	0.141529	-6.040421	0.0000
16	0.079871	0.194047	-4.741789	0.0000

Table-12

(ii) BDS Test for Mid-cap NIFTY Fifty

Joint Tests		Value	df	Probability
Max z (at period 2)*		6.550639	243	0.0000

Individual Tests				
Period	Var. Ratio	Std. Error	z-Statistic	Probability
2	0.398275	0.091857	-6.550639	0.0000
4	0.231724	0.141227	-5.440025	0.0000
8	0.117557	0.175378	-5.031649	0.0000
16	0.061926	0.212879	-4.406606	0.0000

Table-13

(iii) BDS TEST RESULT

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.020303	0.003145	6.455777	0.0000
3	0.038384	0.004989	7.694496	0.0000
4	0.045350	0.005929	7.649053	0.0000
5	0.053480	0.006167	8.671416	0.0000
6	0.055307	0.005936	9.317212	0.0000

Table-14

(i) BDS Test for LNNMH

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.023717	0.003054	7.765183	0.0000
3	0.046589	0.004841	9.624344	0.0000
4	0.055897	0.005748	9.723918	0.0000
5	0.064740	0.005975	10.83569	0.0000
6	0.066165	0.005746	11.51572	0.0000

On the basis of test results that we have obtained, the null hypothesis cannot be accepted since the **P** value is highly significant at 0.00 and the null has been rejected.

Therefore, we conclude that this series has an underlying pattern and it does not follow random walk.

5.5 a. Results of VAR Granger Causality/Block Exogeneity Wald Tests

VAR methodology is used in order to verify whether there is any lead lag relationship among NIFTY FIFTY and Mid-cap indices and the results are as under:

Table-15

(i) VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: RN			
Excluded	Chi-sq	Df	Prob.
RNF100	0.102380	1	0.7490
RNF50	0.489260	1	0.4843
All	1.107512	2	0.5748

Dependent variable: RNF100

Excluded	Chi-sq	Df	Prob.
RN	1.065795	1	0.3019
RNF50	0.185387	1	0.6668
All	1.155907	2	0.5610

Dependent variable: RNF50

Excluded	Chi-sq	Df	Prob.
RN	2.470159	1	0.1160
RNF100	6.01E-05	1	0.9938
All	2.578047	2	0.2755

On the basis of the results that we have obtained we could see that there is no significant impact or short-term causality of Mid-cap securities in India with NIFTY FIFTY. The probability is less than 0.00% and hence the null is accepted, resulting in no impact. It shows the series are highly independent to the highest extent. The series are moving towards efficiency which focuses on Mid-cap securities in Indian stock market.

5.5 b. GARCH MODELLING

Further, Garch modelling was fitted to the series and the following are result.

Table-16

(i) Garch modelling Nifty Mid-cap 100

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.000980	0.000446	2.199019	0.0279
AR(1)	0.107508	0.042219	2.546448	0.0109
Variance Equation				
C	1.18E-05	3.44E-06	3.443197	0.0006
RESID(-1) ²	0.161076	0.035174	4.579407	0.0000
GARCH(-1)	0.732831	0.052621	13.92670	0.0000

According to the Garch results the series depends more on the past shocks, than the previous period shock which is a clear indication that the series has long memory. So the shocks that are subjected to these series do not slide down in the immediate past which is another sign of inefficiency.

5.5 c. Spill over effect

Additionally, we verified whether the large cap segment is impacting Mid-cap securities. Therefore, study undertook a Garch with excel regression model.

Table-17

Dependent Variable: RNF100

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.001885	0.000446	4.226551	0.0000
AR(1)	0.112066	0.039611	2.829145	0.0047
Variance Equation				
C	1.15E-05	2.15E-06	5.375398	0.0000
RESID(-1)^2	0.098502	0.025761	3.823682	0.0001
GARCH(-1)	0.792034	0.034299	23.09221	0.0000
RN	-0.001813	0.000194	-9.322182	0.0000

So, as per the result that we have obtained above, the variance of nifty values resulted negative which is a clear indication that there is absolutely no spill over effect of NIFTY FIFTY on Mid-cap securities in Indian market.

Conclusions

Random walk model test refers to the first very important test. This study involved random walk model to examine whether the series are suitable for explaining the behaviour of the prices. Random walk refers to the changes that occur in the prices which is influenced solely by its past prices and leads to random shock in the market. The model basically has been developed on the basis of past values which are regressed by the variables. Except residual diagnostic the model satisfies and fulfils all the conditions of model adequacy and residual diagnostic suggests the presence of strong autocorrelation. Since the series are not normally distributed in autocorrelation test, also there is an arch effect present in heteroskedasticity in the series. It is perfectly evident that series are not random. If random walk model had the ability to satisfy the series pattern then it would have said that the series is random. As random walk model does not fit, it has been clearly expressed that there is a lot of autocorrelation and there is a huge change in the variation which is called heteroskedasticity. We lead that random walk model is not suitable for this particular series. In other words, we can say that the series is not random and the market is not efficient.

Further we examined the data through runs test to determine whether the series is random or not. If the weak form of information is inefficient the price changes will not be random and will always be influenced by some other variables. So, based on runs test we can conclude that all these indices (variables) NIFTY Mid-cap, NIFTY Mid-cap 100, NIFTY FIFTY fail to accept the null. O, null is rejected in both the cases and in runs test the series is random as the null is rejected in both the cases because the P value of runs test for both the series is below 0.05 considering the above input both the cases null is rejected that means the series is not random that means the market is not efficient.

To verify the same while approaching for VAR which once again tells that the external factors at minimum to these changes of the series and the changes that happened in the impulse response is always respect to their own past values rather than other factor but when we verified by applying granger causality, we understood that these changes are not happening because of any causality relationship between these two variables and NIFTY 50. It also evident that null hypothesis followed the pattern where as alternative hypothesis did not follow the random walk. By granger causality test it was proved that there was no significant impact on short-term causality of Mid-cap security and it expresses the series independent movement and not the dependent. The Garch modelling also resulted that the series independents on previous shocks. The spill over effect clearly indicated the absolute absence of spill over effect of NIFTY FIFTY on Mid-cap securities in Indian stock market.

Therefore, on the basis of all these test of random walk we conclude that this series has a pattern in it and the prices are not random. Hence, the study concludes that the market is inefficient and the series is not normally distributed or the series is not randomly distributed.

Scope for further study

The study can be further taken to predict the stock returns, the research can be extended to examine efficiency of the large-cap, Mid-cap and Small-cap securities which can be utilised to forecast the market conditions, also the comparative study can be made among the different segments of stock market which contributes analysing the information efficiency in stock market.

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