Non-Linear Dependence of Indian Shariah Market

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Abstract

The work focuses on linearity or otherwise of Indian Shariah market i.e. CNX NIFTY, CNX500 and S&P BSE TASIS 50 during the period spanning from 01/January/2008 to 31/June/2013. In order to detect the presence, BDS test of Brock et al (1996) was employed and null hypothesis was strongly rejected the existence of Independent Identical Distribution (IID). On further investigation on presence of IID with the help of GARCH (1, 1) and enquiry on whether the non-linear dependence was caused by predictable conditional volatility, it was found that the non-linearity was caused not by serial dependence or linear dependence rather it was caused by volatility clustering and GARCH effect in the return series. This leads to the inference that the market lacks efficiency and rejects the Random Walk Hypothesis. Hence, alerts the policy makers on the predictability of the market even for short horizon which in principle should not exist, as Shariah market is expected not to give opportunity for abnormal return.

Keywords: Shariah market, IID, non-linear dependence, BDS test, Financial modelling, GARCH.

Prelude

There is extremely sparse literature which utilizes recent advances in the study of linearity or non-linear dynamics especially when it is about Shariah index and Islamic stock returns. Shariah index is an index comprising of representative Shariah compliant shares which indicate the trends of stock abiding to the rules of Islamic finance[3]. *(Iqbal 2005)* out rightly argued that Islamic Finance is not only for Muslims but also for countries where there is sizable Muslim community. As a second largest Muslim population state in the world, India not only can reap the benefits of Islamic banking and Finance more effectively, but can attract more foreign institutional investors (FIIs) from Middle East (*Manzoor, 2013)*. During the financial meltdown the Shariah compliant stocks and the Shariah indices were the out performers beating the market in terms of risk and return. Even though, it attained the preference of an **"Out performer"** (*Akhtar et al, 2010)* in the market during the disintegration, studies and researches were scarce and scanty on the in-depth analysis of Shariah stock market. By the introduction of Islamic Products in the capital markets setbacks can be reduced at huge extent. Some of the Shariah stock market were least affected

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[3] Rules of Islamic Finance is nothing but, taken from the Qur'an and the Sunnah, (the way) referring to the way in which the prophet Muhammad lived his life. It includes the prohibition of Riba (Interest), Maysir and Usury (Speculation & Gambling) and investment in prohibited industries.

with subprime crisis of 2008 (*Karim et al, 2010)*. In the case of India (*Singh & Sudeep, 2013)* proved that Shariah 50 performs better than Nifty 50 and can be treated as a better performer with regard to return and less volatile in terms of risk. Coming to the study on the presence of linearity or otherwise in returns, which in turn will accept or reject the hypothesis of Random walk model, can indicate whether returns are predictable and the market lacks informational efficiency or otherwise. If it is found inefficient, appropriate steps need to be taken at the earliest, because such happening violates the principles laid down by Islamic guidelines indirectly. The reason being the existing informational inefficiency will help the rational investors to adopt the technical analysis in predicting the behaviour of Shariah market at least in short run. At the same time, policy makers need to take cognizant action so that Indian Shariah index doesn't violate the principles of Islamic finance. This work purely intends to investigate the presence of non –linear dependence of Shariah returns in Indian market. It was however, realized that merely identifying the non-linear dependence was not enough because previous literatures have shown that the presence of non- linear features normally takes the form of ARCH and GARCH conditional heteroscedasticity. With respect to Islamic index and stock market research studies can be counted in finger tips. Majority of the studies on Islamic finance had focused on the volatility of the stock prices and advocated in favor of it as universal index to protect the economy from downturns. Some of the main studies in Shariah index conducted across the globe were: (*Majid & Rosylin, 2009)* explored the relationship between macro-economic indicators and Islamic behaviour of Malaysian stock market and interpreted that exchange rate, money supply, treasury bills and Federal Fund Rate influences the market on a long run. (*Rahim,2009)* evaluated the information transmission and correlation between Islamic stock indices in South East Asia with regard to return and volatility level of daily returns. The study found out that the day of the weekend effect was present only in KLSI and not for FBM Emas Shariah and FBM Hijarah Shariah. Another research was done by (*Akhtar et al, 2010)* who analysed the intensity of volatility linkage between Islamic and conventional markets. Since the crisis had affected the diversification benefits, the investor couldn't get a better payoff during peak times. It was concluded that the intensity of volatility linkages was found weaker in Islamic markets in comparison to non-Islamic markets, as there exist a smaller set of common information and lower cross-market hedging activity in Islamic markets. (*Chiadmi & Fouzia, 2012)* argued the volatility presence of SP 500 index over SP Shariah during the period December 2006 to March 2011 by considering SP 500 index over SP Shariah indices. The main objective of the study was to compare the two stock market indices in terms of volatility behaviours. The statistical properties of both the indices showed that SP Shariah was less volatile in terms of standard deviation during the study period. The results of auto correlation test showed that the returns of SP Shariah were not independent but were identically distributed, and thus rejected the hypothesis of white noise. The authors concluded that the returns of SP Shariah was less volatile when compared to SP 500 index during the subprime crisis. The reason attributed to such behaviour were the restrictive covenant like prohibition of interest and speculation imposed on Shariah stocks.

Even though many studies have addressed volatility of Shariah index, (*Romli et al, 2012)* studied the volatility during the financial crisis i.e. during the period 2007 to 2010. The index considered for the study was FTSE Bursa Malaysia Hijarah index. It was concluded that the Malaysian Bursa index was less volatile during the crisis period when compared to conventional indices of Malaysia. *(Abikan 2012)* validates the viability of Islamic Financial System when compared to the conventional financial system in order to save form the attacks of meltdowns and turmoil's. (*Sania & Deo, 2013)* proved that Indian Shariah market was predictable with macro-economic indicators during the study period and necessary policy measures need to be taken to correct those since Shariah principle prohibits speculation and abnormal profit. *(Doran et al 2013)* also points out the benefits of investing in Shariah compliant shares so as to diversify the risk.

The initial part of the paper emphasises on the linearity test with BDS test by (*Brock, et al, 1996)* and later the part of investigation utilises GARCH model proposed by (*Bollerslev, 1986).* Number of studies on non- linearity have been conducted on several indices including Indian market. There were several literatures starting right away from (*Fama, 1965)* who was of the opinion that there were restrictions in the usage of linear modelling techniques and tools formulated were not sophisticated enough to capture the complicated pattern of returns. (*Brock et al, 1992)* pointed out that if there found a presence of non-linear dependence then it questions the theory of Random walk model. (*Tokumaru, 1980)* suggested that non-linear models may exhibit no serial correlation while containing strong non-linear dependence. Several studies across the globe proved a non-linear behaviour in the returns. Like (*Hamill and Opong, 1997)* accepted the hypothesis of presence of non- linear dependence in Irish stock market. (*Opong et al, 1999)* focused on the non-linearity and randomness of UK stock returns using Hurst exponent, BDS test and GARCH (1, 1) model. They concluded that the returns were not random and not IID and GARCH (1, 1) model explains the behaviour of index series. (*Hinich and Douglas, 1985)* employed fifteen common daily stock returns of USA, and evaluated through Gaussanity and linearity test. It was concluded that daily stock returns were generated by a non- linear process. (*Sewell et al, 1993)* reported that the returns of Japan, Hong Kong, Korea, Singapore and Taiwan proved the dependencies and for US it showed the presence of IID. (*Poshakwale, 2002)* proved that there was non-linear dependence in Indian stock returns and GARCH models could successfully capture these dependencies. Other study which focused on linearity and volatility like; (*Brails ford and Faff, 1996), (Brooks, 1998) and (Kumar and Dhankar, 2010)* concluded that GARCH model provide a concrete and authentic result on forecasting returns and volatility by employing US stock returns. (Hsieh, 1991) concluded that ARCH type models do not completely describe the non-linearity in stock returns. (*Tse and Tung, 1992)* contradicted earlier studies and proved that exponentially weighted moving average models provide better results than GARCH models. (*Kumar and Raj, 2011)* examined the non-linearity and heteroscedasticity of monthly opening and closing price of New York stock exchange listed index S&P 500 and concluded that there was a positive and significant relationship between unexpected volatility and stock

returns of US. (*Gourishankar and Bandi, 2010)* employed Bi- spectrum test statistics, BDS test, windowed Hinch test and concluded that there is a presence of non- linear dependence in the Indian stock market. When studies have been in lime light on Indian market and developed markets, the present work attempts to detect the presence of non-linearity in Indian Shariah market and to check whether the returns can be modelled applying GARCH model in Indian Shariah market.

Model Specification and Methodology

The study focuses on non-linearity dynamics and modelling of returns through GARCH (1, 1) model of Indian Shariah market i.e. CNX NIFTY Shariah, CNX500 Shariah and S&P BSE TASIS 50. The time period spans from 01/January/2008 to 28/June/2013. With the data set the daily returns were calculated as $\mathbf{R_t = Log10\ (P_t/P_{t-1})*100}$**.** The indices studied were;

- CNX Nifty Shariah
- CNX 500 Shariah
- S&P BSE Tasis 50

The study attempted to test non-linear dependence by applying BDS test developed by *(Brock et al 1996)* which sets the null hypothesis that these returns are independent and identically distributed (IID).

BDS test employs the concept of spatial correlation from chaos. The computations of BDS test follow the following procedures.

1. The time series with N observation, is the first difference of the natural logarithms of raw data in time series.

$$\{x_i\} = [x_1, x_2, x_3, ..., x_N]$$

2. The time series is embedded into m-dimensional vectors, by selecting the value m and successive points in the series. This converts the series of scalars into a series of vectors with overlapping entries.

$$x_1^m = (x_1, x_2, ..., x_m)$$
$$x_1^m = (x_2, x_3, ..., x_{m+1})$$
$$M$$
$$x_{N-m}^m = (x_{N-m}, x_{N-m+1}, ..., x_N)$$

3. Then the correlation integral, is computed which measures the spatial correlation among the points, by adding the number of pairs of points (I,j), where 1≤i≤N and 1≤j≤N, in the m-dimensional space which are "close" in the sense that the points are within a radius or tolerance ε of each other.

$$C_{E,m} = \frac{1}{N_m(N_m - 1)} \sum_{i \neq j} I_{i,j;\varepsilon}$$

$$where, I_{i,j;\varepsilon} = 1 \qquad = 0 \text{ otherwise}$$

$$if \left\| x_i^m - x_j^m \right\| \leq \varepsilon$$

4. Brock, Dechert and Scheinkman (1987) showed that if the time series is I.I.D

$$C_{\varepsilon,m} \approx [C_{\varepsilon,1}]^m$$

If the ratio N / m is greater than 200, the values of ε / σ range from 0.5 to 2 (Lin, 1997) and the values of m are between two and five (Brock et al., 1988), the quantity $[C_{\varepsilon, m} - (C_{\varepsilon, 1})^m]$ has an asymptotic normal distribution with zero mean and a variance $V_{\varepsilon, m}$ defined as:

$$V_{\varepsilon,m} = 4[K^m + 2\sum_{j-1}^{m-1} K^{m-j} C_\varepsilon^{2_j} + (m-1)^2 C_E^{2m} - m^2 K C_E^{2m-2}]$$

$$Where, K = K_\varepsilon = \frac{6}{N_m(N_m - 1)(N_m - 2)} \sum_{i<j<N} h_{i,j,N;\varepsilon}; h_{i,j,N,E} = \frac{I_{i,j;\varepsilon} I_{j,N;\varepsilon} + I_{i,N;\varepsilon} I_{N,j;\varepsilon} + I_{j,i;\varepsilon} I_{i,N;\varepsilon}]}{3}$$

5. The BDS test statistic can be stated as:

$$BDS_{\varepsilon,m} = \frac{\sqrt{N[C_{\varepsilon,m} - (C_{\varepsilon,1})^m]}}{\sqrt{V_{\varepsilon,m}}}$$

BDS test is a two-tailed test, the null hypothesis would get rejected if the BDS test statistic is greater than or less than the critical values (e.g. if α = 0.05, the critical value = ± 1.96).

Any time series data needs assurance of the stationarity i.e. there shouldn't be any unit root issues in the series. A time series is stationary if its mean and variance are constant over time. But there are evidences where time series data show a non stationarity (Engle & Granger 1987). Hence before going into in-depth modelling of the data it is necessary to check the stationarity property of the series. In order to check stationarity or otherwise ADF[4] test, PP [5]test and KPSS[6] test have been used.

[4] The **Augmented Dickey- Fuller** follows a regression line i.e.

$$\Delta Y_t = \beta_1 + \beta_2 + \sigma Y_{t-1} + \sum_{t-1}^{m} \alpha_i \Delta_{t-i} + \varepsilon_t$$

where ε_t is a pure white noise error term and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. the number of lagged difference terms to include is often determined empirically, the idea

The null hypothesis for ADF test and PP test assumes that the series has a unit root and KPSS test assumes that the series are stationary. The non stationarity in the data is explored by applying test capable of detecting the presence of unit roots. The presence of unit root implies that there is non- stationarity in the returns. For the purpose of detecting the same three well known test have been used.

Modelling of BDS with GARCH (1, 1)

If the BDS identifies non-linearity in the series it is obvious that it is due to changes in the volatility of the series and in order to detect this attempt has been made to fit GARCH (1, 1) model and the specification of GARCH (1, 1) model is as follows;

$$\sigma_t^{\ 2} = \omega + \alpha_1 \varepsilon^2{}_{t-1} + \beta_1 \alpha^2{}_{1-1}$$

where σ_t^2 conditional variance whereas ω is constant, $\alpha_1\varepsilon^2_{t-1}$ is Arch term and $\beta_1\sigma^2_{t-1}$ is sum of squared residual/ GARCH term. The Arch effect[7] is identified through F statistics and observed $R^{2.}$ The fitness of the model is identified through serial correlation test[8] and Arch effect and normality of residuals. The Normality of residuals are not serious issues even if the null hypothesis is not accepted. The model created for identifying the volatility will be precise and reliable.

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being to include enough terms so that the error term in the above equation; gets serially uncorrelated. In ADF we will test whether σ = 0 is tested and the ADF test follows the same asymptotic distribution as the DF statistic, so that the same critical values can be used.

[5] **Philips Perron (1988)** developed a generalization of the ADF test procedure that allows for fairly mild assumptions concerning the distribution of errors. The test regression of the Phillips-Perron (PP) test is the AR (1) process.

$$\Delta Y_t = \alpha_0 + \beta Y_{t-1} + \varepsilon_t$$

[6] The alternative unit root test introduced by **Kwiatkowski – Phillips – Schmit – Shin (KPSS)** in the year 1992, has the null hypothesis on stationarity of a series around either mean or a linear trend. The KPSS test is the sum of three components i.e. deterministic trend, a random walk and a stationary error term. The model of KPSS takes the following form;

$$y_t = \xi t + r_t + \varepsilon_t$$
$$r_t = r_{t-1} + \mu_t$$

Where y_t, t = 1, 2, …, T denotes series of observation of interest, t – deterministic trend, random walk process, ε_t - error term of the first equation, by assumption is stationary, μ_t denotes an error term of second equation, the assumption of the series is identically distributed random variables of expected value equal to zero and constant.

[7] ARCH Effect: The presence of white noise disturbances and is detected through Lagrange Multiplier test before modelling the series. It is done with the help of E-views software.

[7] Serial Correlation Test: In statistics, autocorrelation is a random process which describes the correlation between values of the process at different times, as a function of the two or of the time difference.

Discussions

In order to understand the normality of the return the study employed descriptive statistics with the help software. The descriptive statistics of return series of CNX Nifty, CNX 500 and S&P BSE Tasis 50 is reported in Table (1); and the series in total depicts that the returns are not normal.

Table 1: Descriptive Statistics of the Return Series.

Indices	μ	Std.Dev	Skewness	Kurtosis	J-B
CNXNIFTY	-0.0001	0.017	0.276	13.816	653.681**
CNX 500	-0.0001	0.016	0.075	13.800	633.439**
S&P BSE	0.0176	1.425	0.051	11.842	452.719**

Note 1: *Total number of observations were CNX NIFTY Shariah: 1362, CNX 500 Shariah: 1365, S&P BSE Tasis 50: 1357. All the names of the indices are shortened & shown as CNX NIFTY, CNX 500 and S&P BSE*

*** Significance at 5% level of confidence, J-B indicates Jarque-Bera statistics.*

The series are positively skewed with negative mean and median. The negative **μ** and lower standard deviation shows that low expected returns and risk. But S&P BSE Tasis shows a positive return but a higher standard deviation which explains that its risk is higher when compared to other indices. The kurtosis clearly shows that the returns have fatter tails than the normal distribution since it is more than the value of kurtosis which is 3, and the series is Leptokurtic. The hypothesis of normality of residuals is not accepted since that value of Jarque Bera statistics also for all the indices are significant. Hence it was concluded that the returns of Indian Shariah market were not normal during the study period.

Table 2: Unit Root Results of the Indices.

Variable	ADF	PP	KPSS
CNX NIFTY	-35.36*	-35.35 *	0.219
CNX 500	-34.33 *	-34.33 *	0.279
S&P BSE	-34.12 *	-34.12 *	0.227

Note 2*: The null hypothesis of KPSS is the series are stationary*

Note 3*: The lag lengths included in the models are based on the Akaike Information Criterion at level with constant & no trend.*

** Significance at 1% level*

The stationarity test of the series were investigated through ADF test PP test and KPSS test presented in Table (2). In order to avoid the limitations with ADF stationarity test the returns were cross checked with PP test which follows the same null hypothesis of ADF i.e. there is unit root in the series and the KPSS follows the null hypothesis of there is stationarity in the series.

Table 3: Results of the test for non- linearity using BDS statistics:

	BDS			Z statistics		
	CNX NIFTY	*CNX 500*	*S&P BSE*	*CNX NIFTY*	*CNX 500*	*S&P BSE*
2σ	0.021	0.024	0.023	9.746*	10.416*	10.765*
3σ	0.033	0.038	0.034	13.765*	14.809*	15.044*
4σ	0.033	0.040	0.033	17.286*	18.753*	18.692*
5σ	0.029	0.036	0.028	21.324*	23.159*	22.482*
6σ	0.023	0.029	0.021	25.665*	28.027*	26.784*

Note: 4 *The 'σ' represents the standard deviation of the series with a broad range of values from 2 to 6 were estimated.*

**significance at 1% level*

From the results it is clearly evident that there was a presence of non-linearity in the returns of the Shariah index at 1% significance level. Thus the results strongly rejects the null hypothesis of Independently and Identically Distributed (IID) returns at 1% significance level. As the null hypothesis is rejected, it is clearly inferred that there is significant non linearity in the return series, so it is necessary to study the nature of non- linearity. Toward this purpose we explored volatility clustering and then modelling of GARCH (1, 1) model in the series.

Modelling GARCH techniques:

Several empirical studies show that GARCH (1, 1) provides a parsimonious fit for returns and its volatility (Bollerslev 1989). This study stabs fitting the GARCH (1, 1) model in Shariah returns of India in order to capture the volatility clustering[9] and non- linear dependence. In order to trace out the persistence in return, volatility clustering is employed at the introduction stage. Volatility clustering implies a strong correlation in squared returns. In order to test volatility clustering Ljung Box was employed where n represent sample size and k the lag length. The persistence of autoregressiveness is tested through GARCH (1, 1) model where volatility clustering was identified and depicted in graph (1), (2) and (3) [10]which clearly indicated that these three indices CNX nifty, CNX500 and S&P BSE Tasis 50 follow volatility clustering, where in during periods of turbulence their prices showed wide swings and in periods of tranquillity wide swings were absent. Engle (ARCH model) argues that as like mean, Variance also varies and need to take into account - so for mean -

[9] Volatility clustering simply means that periods of highs will be followed by periods of highs and periods of lows/tranquillity will be followed by periods of lows. It is identified that the AR and MA process is at (1, 1) integration.

[10] Graph of Volatility Clustering is provided in Annexure No:1

AR model, and for variance - MA model need to be explored. Hence the modelling was done and the series followed an ARMA (1, 1) process.

Since ARCH (1) doesn't capture adequately the volatility persistence found in asset returns, it is extended into ARCH (M) or ARCH Mean model by including GARCH (1, 1) model .In the attempt to find out the patterns in modelling and heteroscedasticity[11] in the returns the ARCH LM test[12] was employed and it was found that there was no homoscedasticity in the returns which even gives further scope for volatility clustering.

Table 3: Results of ARCH effect from ARCH LM test:

	CNX NIFTY	CNX500	S&P BSE
F statistics	19.998*	31.025*	42.607*
Observed R^2	19.737*	30.378*	41.354*

***Note 5**: The lag considered for ARCH LM Test was 5 lags & selection was done through Unrestricted Vector Error Correction Model.*

**Significance at 1% level*

From the results shown in the table (3) it is clearly found that the ARCH effect and null hypothesis of CNX 500, CNX nifty and S&P BSE Tasis 50 could not be accepted since the F statistics and observed R^2 were significant at 1%. It hence suggest that there is a further scope for modelling volatility. The volatility clustering of all the indices also show that high returns are followed by high returns and low returns are followed by low returns.

Table 4: Results of GARCH (1, 1) of the indices.

Indices	**ω**	**α**	**β**	**α +β**
CNX NIFTY	0.0036	0.1052***	0.893***	0.998
CNX 500	0.0023	0.114***	0.870***	0.984
S&P BSE	0.0029	0.1197***	0.878***	0.997

[11] Heteroscedasticity: It is the correlation between error terms of a series.

[12] ARCH LM Test: A test conducted with the help of the software E-views 7.0 in order to detect ARCH effect in the series.

The result of GARCH(1,1) presented in table (4) depicts that the α is small for CNX NIFTY Shariah when compared to CNX 500 and S&P BSE Tasis 50 Shariah which indicates that the shock to conditional variance will not take much time to die out. The coefficients of variance equation i.e. GARCH term are positive and significant at 10% level provides clue that successful modelling is possible to capture volatility.

The high significance of **α** (ARCH term) and **β** (GARCH term) implied that past volatility highly influenced the current volatility of all the series under study. As both ***α*** *and* ***β*** were significant, it indicated that the lagged conditional variance and lagged squared variance had impact on current volatility.

From the sum values of co-efficient of **α+β** of the series, it was clearly evident that all the indices showed a value which is close to unity thus implies that the volatility of all the series were highly persistent with 10% significance level of acceptance.

Thus GARCH (1, 1) model was successfully employed in order to capture the existence of excess volatility and fat tail feature of the return of Shariah indices. From the results it can be concluded that the excess volatility is captured through GARCH (1, 1) model and it also has an influential power in predicting the return with one days lag. The questions comes how GARCH (1, 1) model explains non-linearity through BDS test. The acceptance of the hypothesis IID imply presence of heteroscedasticity which is responsible for non- linearity in returns. Hence modelling of GARCH (1, 1) is considered to be the appropriate model to capture the non-linearity in the returns.

After processing GARCH (1, 1) model other higher order model[13] were employed to check the significance. Higher order GARCH models either did not converge or the parameters were insignificant at the conventional levels of significance. Hence it was concluded that this model perfectly fitted in the process and is a representative of the conditional volatility process of the daily returns of the series. Further diagnostic checking[14] of the model also revealed that GARCH (1, 1) was a better fit than highest order ARCH models available.

The model fitness was ensured through serial correlation test after fitting the model and the results showed that there was serial correlation, thus the null hypothesis got accepted which explains that the series are not serially correlated after the formulation of the GARCH (1, 1) model.

Concluding Remarks

The study attempts to trace out the non – linearity of the Indian Shariah returns for the time period i.e. CNX NIFTY, CNX500 and S&P BSE TASIS 50 and the time

[13] GARCH (2, 1) was employed and it rejects the homoscedasticity and ARCH test along with Normality test in diagnostic checking.

[14] Diagnostic checking of GARCH (1, 1) model was conducted through testing serial correlation test, ARCH effect and normality test and the model fitted removes all the constraints and is significant at 1% level.

period spans from 01/January/2008 to 31/June/2013. In order to detect to linearity BDS test of Brock et al (1996) was employed and null hypothesis was strongly rejected and implied IID was not caused by non- stationarity or by linear dependence. The non- linearity was caused by the volatility clustering and GARCH effects in the returns, which was proved through GARCH (1, 1) model. Though the results reject random walk hypothesis it doesn't emphatically mean that the returns are predictable for a long horizon. It simply indicates that excess profit can be earned for short span of time.

To conclude, the prevalence of non-linearity in financial time series data particularly in Islamic stock market, need to be taken seriously as it gives scope for abnormal return which is not entertained in Shariah guidelines. The results shows that there exist scope for investors and speculators for earning abnormal profit by scrutinizing the movements of the market. At the same time it can be taken with all seriousness by the policy makers and regulators for the need to introduce appropriate measures, as the Shariah principle forbids abnormal profits and speculation. The results suggests that there is a need to control and regulate the market in desired direction. This conclusion adds value to existing literatures on Shariah market and its efficiency.

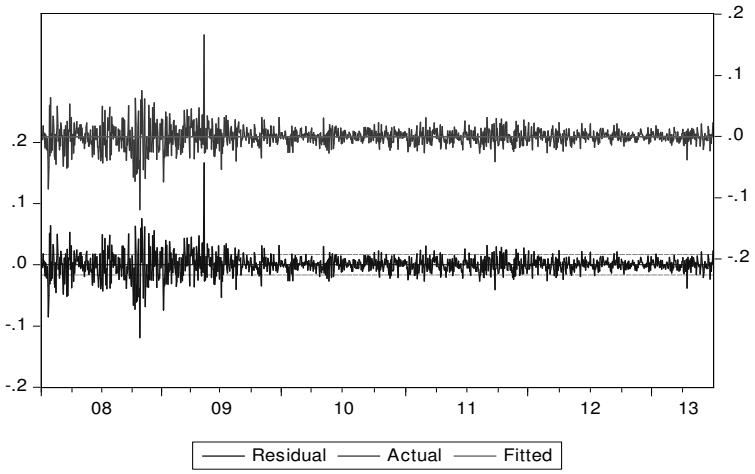
Policy Implications

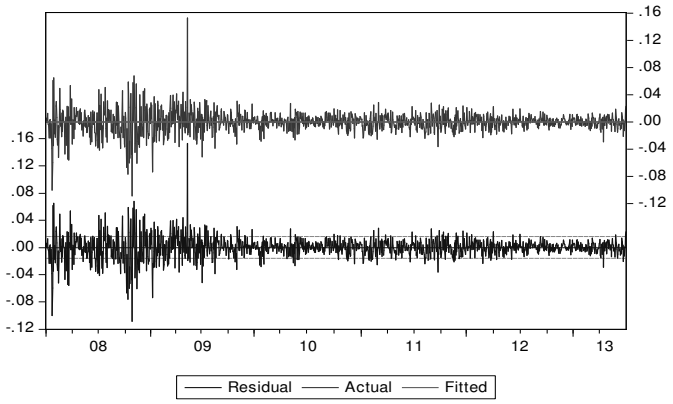
Since it was found that there exists Linear Dependence of stock prices in India Shariah Market it is the duty of Policy makers to carry on with necessary action so that Indian Shariah market becomes efficient with regard to its returns which brings in equanimity, thereby removing scope for speculation and abnormal profit. Annexure No (1):

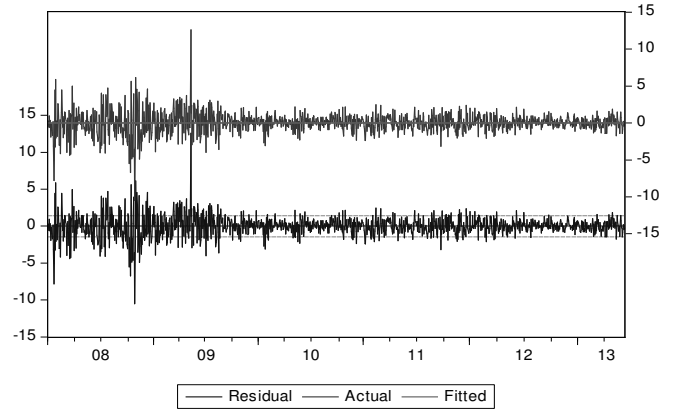
Graph showing the volatility clustering of indices:

Graph (1) ***showing the volatility clustering of CNX Nifty***

Graph (2) ***showing the volatility clustering of CNX 500***







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