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Intra- Market Relationships In Indian Equity Market: A Study On BSE Sensex And Sectoral Indices

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ABSTRACT:

Understanding market performance is always an area of interest for market investors and the economy as a whole. The main purpose of this paper is to investigate the intra-market relationship between BSE and Sectoral indices. For this purpose, the data set comprises BSE Sensex data and seven sectoral indices namely Fast-Moving Consumer Goods Sector Index, Finance Sector Index, Industry sector Index, Information Technology sector index, Oil and Natural Gas sector index, Power sector index, and Telecom's sector index. The study uses OLS regression, ADF, and Granger Causality tests to determine the mutual interdependence of the sectors. The findings of the study reveal that there is no bi-directional relation between the variables. In the case of three sectoral indices relations, there is a unidirectional relation.

Keywords: BSE Sensex, Sectoral Indices, Granger Causality test.

INTRODUCTION:

Any investor always desires that their investment yields the maximum returns but at the same time they want to assume minimum risk to earn the high return. The secondary market is an avenue which may satisfy the investors' desire to earn maximum returns but for this, the risk which they would have to assume would also be very high. It is also wise not to invest all money in one security but to invest in a well-diversified portfolio of securities. For this, one needs to possess quite a large sum of money and at the same time should have adequate knowledge of the performance of the different securities in the market, for any unwise decision may result in disastrous consequences. The fate of the economy of any country is intertwined with the stock markets of that country and this is especially true for the emerging economies and their stock markets (Verma, 2005)[1] due to which, of late, emerging stock markets have assumed great importance among the investor community worldwide.

LITERATURE REVIEW:

There have been considerable numbers of research work in the arena of stock market studying different elements of stock market and its related operations. This work is no different to that concept and approach of work. Though the present work is attempted to look into a kind of relationship between the sector-based index values (sectoral indices) and one of the prominent index values of India i.e., BSE Sensex. Numerous research works is done by wide range of scholars taking BSE Sensex data as independent value.

In international and national platform, studies have primarily focused on establishing relationship between different stock markets of different countries. Of such studies many works found considerable relationship between variables under study and contrary to that significant numbers of study also fail to establish any relationship between the variables. In a study conducted by Anorou (2003)[2] found a significant relationship between Singapore and US market with Asian markets. These markets (Singapore and US) have significant influential role in overall Asian market. Syriopoulos (2007)[3] in a study noticed a co-movement amongst the markets. The Central European market is believed to have strong linkage with mature markets like USA, Hong Kong, so on. The US market has shown its prime leading influence over the entire world market. The integration amongst markets is led by developed markets and amongst all sectors, service sector is financially more integrated (Mukhopadhyay, 2009)[4]. Agmon (1972)[5], found that there exists a substantial amount of relationship amongst the equity markets of the US, UK, Germany and Japan. In a study of 12 European equity markets and US equity market presence of correlation is noticed (Meric and Meric, 1997)[6]. Kurihare and Nezu (2006)[7] found long-term relationship between the US and Japanese stock markets. Studying the Indonesian, Singapore and Malaysia Stock market, Febrian and Herwany (2007)[8] found a positive correlation between the same. In terms of aggregate stock market and sector-wise performance the Equity market of U.K. was more integrated with Europe (Antoniou, 2007)[9]. Chandran and Rao (2009)[10], observed long run integration result between stock indices of Malaysia and South Korea. In Indian context, the Indian stock market return is led by major stock index returns such as US and Japan and other Asian markets such as Hong Kong, South Korea and Singapore (Mukherjee and Bose, 2008)[11]. Chittedi (2010)[12] found that there exists a cointegration between Indian market and the US, UK, Japan, France and Australian stock market. In a similar kind of study Taneja (2012)[13], found a long-run relationship between Indian stock market and US, France, Japan, Taiwan and Singapore stock markets. In 2005 a study by Lamba[14] reveals that the Indian market has been influenced by the US, UK, and Japan markets and this influence has persisted following Sept. 11, 2001 terrorists attack on the US soil. Such kind of relationship between the markets across the world signals the less possibility of diversification benefits for global investors.

Contrary to this there are significant number of studies which depicts low degree of relationship in both long run and short run market dynamics. In some markets there is a possibility significant international portfolio diversification opportunity from a global investment perspective (Birau and Antonescu, 2014)[15]. Kiviaho, Nikkinen, Piljak and Rothovius (2014)[16] found that co-movement had been relatively less for frontier markets of central and south eastern European region than Baltic region. Md. Hussain, Yusni, Fidlizan (2013)[17] found that Indonesian stock market is not integrated with the Malaysian and world market. This creates an opportunity for investors to diversify their investment portfolio. Leading markets have less integration with world markets, so it offers opportunity of diversification benefits to the investors (Berger, Pukthuanthong and Yang, 2011)[18]. Siminica and Birau (2014)[19] study reveals that there is no causality relationship and having low correlation between Romania, Spain and Italian Stock markets. Wide range of other studies alsoreveals that there is no integration / relationship between markets which gives an opportunity to investors to reap the benefits of diversification (Patel (2013)[20]. Siminica and Birau (2014)[21] in their paper found no causality relationship and low correlation between Romania, Spain and Italian Stock markets. Singh and Rashmi (2018)[22] in their study noticed that there is no long run equilibrium relationshipbetween the Indian, Hong Kong, China and US stock market, though in the short run the Indian market is integrated with Hong Kong and US market. Rajwani and Mukherjee (2013)[23] found that the Indian market is not integrated with any of the Asian markets either individually or collectively, and it is also not sensitive to the dynamics in these markets in the long run. In a similar kind of research work by Islam (2014)[24] found that India did not have significant interdependency on other Asian markets during the Asian crisis.

OBJECTIVE OF THE STUDY:

The main objective of the study is

- To study the possibility of causal relationship between BSE Sensex Indices and Other Sectoral Indices of Bombay Stock Exchange.

DATA AND METHODOLOGY:

To achieve the objective of the study, the work has considered an extensive process of methodology. For this purpose, the data relating to the daily trading day closing stock index value of BSE Sensex and seven other sectoral indices has been considered. The other seven sectoral indices considered for the study are Fast Moving Consumer Goods Sector Index (FMCG), Finance Sector Index, Industry sector Index, Information Technology sector index, Oil and Natural Gas sector index, Power sector index and Telecom's sector index. Each individual sector index reflects the effect of movement in price of companies included within its sector. For selection of Sectoral index an inclusion and exclusion criteria has been adopted considering the availability of the data in the BSE India website. Sectors which are having maximum nos. of daily trading day closing stock index value are considered for the purpose of study. After setting the criteria of inclusion and exclusion, total seven sectoral indices have been considered and accordingly used in the further process of the study. The dataset extends from September, 2005 to April, 2021, for a total 188 daily trading day closing indices value.

Based on the collected raw data, further process has been followed to draw out more informative and relevant data points to undertake the study. With the help of collected data related to BSE and seven selected sectoral indices, daily returns of the variables have been determined. For the purpose of calculation of daily return of selected variables, the following formula has been adopted.

$$Return = \left\{\frac{\text{Today's Index value} - \text{Yesterday's Index Value}}{\text{Yesterday's Index Value}}\right\} X\ 100$$

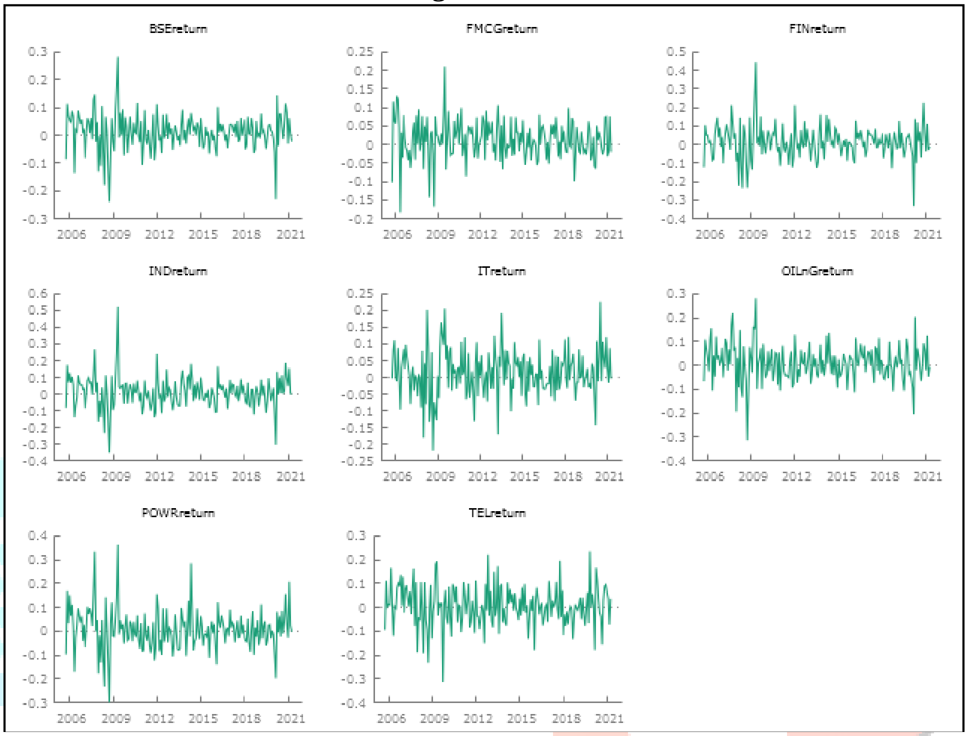
The return value has been expressed in percentage. Returns are used instead of index value, as the returns gives a better picture of the magnitude of growth or change and help in better estimation and forecasting of the index prices (Khanum, Vedashree, Suresh, Lijeesh, 2019)[25].

For statistical analysis suitability the selected sectors (variables) have been codified based on the nomenclature of the sector. The BSE Sensex Index estimated return value is codified as *BSEreturn*. Likewise, Fast Moving Consumer Goods Sector Index (FMCG) return is termed as *FMCGreturn*, Finance Sector Index return as *FINreturn*, Industry sector Index return as *INDreturn*, Information Technology sector index return as *ITreturn*, Oil and Natural Gas sector index return as *OILnGreturn*, Power sector index return as *POWRreturn* and Telecom sector index return as *TELreturn*.

The study examines the descriptive statistics of the selected variables. To achieve the objective of the study, the work incorporates OLS regression showing the influence of sectoral index value on BSE index value. Further few model specification tests like BP test for heteroskedasticity, LM test for autocorrelation, ARCH effect, Normal distribution test and Ljung Box Q statistic test has been followed to justify the relevance and reliability of the OLS regression. Later the study incorporates; Unit root test, Lag length selection criteria and Granger Causality test for different pairs of indices are conducted to test the possibility of casual relationship between BSE Sensex and Seven selected sectoral indices.

RESULTS AND DISCUSSION:

Figure no. 1



OLS REGRESSION RESULTS:

Table no. 1

Model 1: OLS, using observations 2005:10-2021:04 (T = 187)

Dependent variable: *BSEreturn*

	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	−0.00115857	0.000858235	−1.350	0.1787
FMCGreturn	0.153026	0.0186346	8.212	<0.0001*
FINreturn	0.272190	0.0214387	12.70	<0.0001*
INDreturn	0.101665	0.0279567	3.637	0.0004*
ITreturn	0.210403	0.0131413	16.01	<0.0001*
OILnGreturn	0.197261	0.0192893	10.23	<0.0001*
POWRreturn	0.0370601	0.0247773	1.496	0.1365
TELreturn	0.0442119	0.0130163	3.397	0.0008*

Mean dependent var	0.011348	S.D. dependent var	0.064418
Sum squared resid	0.022472	S.E. of regression	0.011205
R-squared	0.970885	Adjusted R-squared	0.969746
F(7, 179)	852.7185	P-value(F)	7.7e-134
Log-likelihood	578.6455	Akaike criterion	−1141.291
Schwarz criterion	−1115.442	Hannan-Quinn	−1130.817
Rho	−0.137585	Durbin-Watson	2.260430

The findings of the OLS regression as presented in table no. 1 shows that other than the variable *POWRreturn* all variables i.e., *FMCGreturn*, *FINreturn*, *INDreturn*, *ITreturn*, *OilnGreturn* and *TELreturn* have a significant influence on the dependent variable *BSEreturn*. The significant variables are having a p-value of less than 0.01 which indicates their influence on the BSE return variable.

With every 1 unit increase in the *BSEreturn*, there is a 0.15 unit increase in the return of *FMCG*. Likewise, for *FINreturn* it is 0.2 unit, *INDreturn* its 0.10unit, *ITreturn* 0.21 unit, *OILnGreturn* 0.19 unit and *TELreturn* has 0.044 unit increase against every one unit increase in *BSEreturn* variable.

With a R^2 value of 97.09, it could be noted that the model variable fit into the regression model. This indicate that the variance proportion in the dependent variable i.e. *BSEreturn* is well explained by the independent variables of the model i.e., *FMCGreturn*, *FINreturn*, *INDreturn*, *ITreturn*, *OILnGreturn*, *POWRreturn* and *TELreturn*.

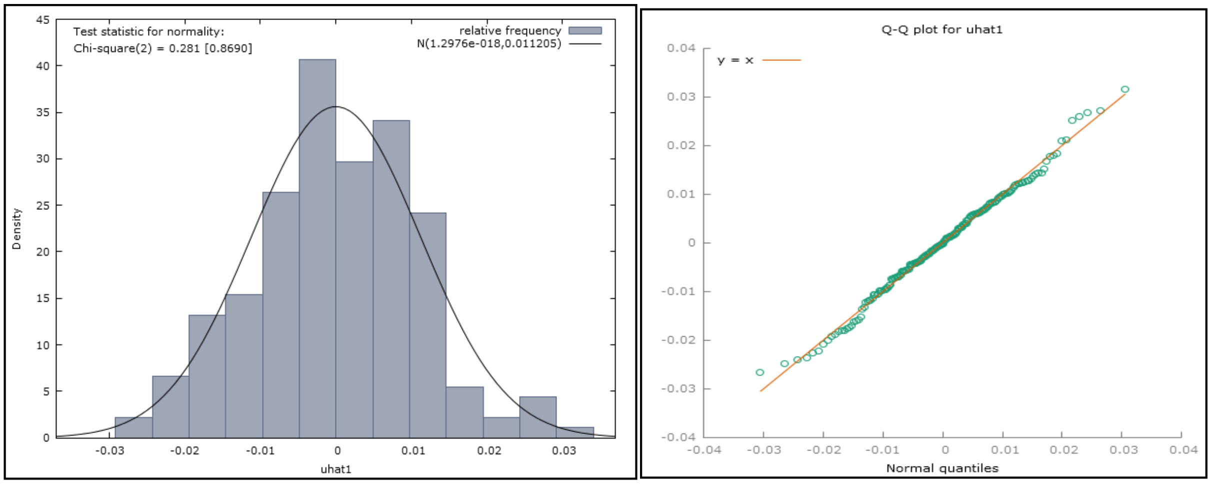
The adjusted R^2 statistic, which is more suitable for comparing models with different numbers of independent variables, is 96.97 percent. It also justifies the explanatory power of independent variables on dependent variable.

Granger and Newbold suggested a rule of thumb when estimating regression with time series data. If the value of R^2 is greater than value of DW statistics, then one should suspect a spurious regression (http:// economics.sotan.ac.uk)[26].

MODEL SPECIFICATION TESTS:

Breusch-Pagan test for heteroskedasticity - Null hypothesis: heteroskedasticity not present Test statistic: LM = 9.53299 with p-value = P (Chi-square (7) > 9.53299) = **0.216618**
LM test for autocorrelation up to order 12 - Null hypothesis: no autocorrelation Ljung-Box Q' = 9.42031, with p-value = P (Chi-square (12) > 9.42031) = **0.667**
Test for ARCH of order 12 - Null hypothesis: no ARCH effect is present Test statistic: LM = 10.7701 with p-value = P (Chi-square (12) > 10.7701) = **0.548716**
Test for normality of residual - Null hypothesis: error is normally distributed Test statistic: Chi-square (2) = 0.280791 with p-value = **0.869014**

Figure no. 2:
Test Statistics for Normality and Quantile – Quantile (Q-Q) Plot



Interpretation of Model Specification Tests:

To test the presence of heteroskedasticity in linear regression model (OLS) and to assume that the error terms are normally distributed, BP test for heteroskedasticity has been used. The BP statistic, test the variance of errors form the value of independent variables. If the test statistics has a p-value below an appropriate threshold ($p<0.05$) then the null hypothesis is rejected and heteroskedasticity assumed.

As per BP test for heteroskedasticity the p-value is 0.216, which is more than the p-value of 0.05 and hence Ho (Null hypothesis) cannot be rejected. The null hypothesis assumes that there is no heteroskedasticity in the equation. Presence of heteroskedasticity leads to inefficient estimators. The tests of hypothesis are no longer valid due to the inconsistency in the co-variance matrix of the estimated Regression coefficients.

Homoskedasticity is a condition in which the variance of the residual, or error term, in a regression equation / model is constant. That is, the error term does not vary much as the value of the predictor variable changes.

While testing autocorrelation, ARCH effect and normal distribution of residuals, the results reveals that the null hypothesis under all the three parameters cannot be rejected and hence the model is fit to analysis further.

Autocorrelation refers to the degree of correlation between the values of the source variables across different observations in the data. In a regression analysis autocorrelation of the regression residuals can also occur if the model is incorrectly specified.

Autocorrelation can cause problem in conventional analysis that assumes independence of observations.

The Ljung Box Q statistic is use to test whether a series of observations over time are random and independent or not. If observations are not independent, one observation can be correlated with a different observations k time unit later, a relationship called autocorrelation. Autocorrelation can decrease the accuracy of a time-based predictive model, such as time series plot, and lead to misinterpretation of the data.

The LB Q statistics tests the null hypothesis that autocorrelation up to lag k equal Zero i.e., the data values are random and independent up to a certain number of lags.

The Q-Q plot or Quantile – Quantile plot is a graphical tool to help us assess if a set of data plausibly came from same theoretical distribution such as a Normal or Exponential. If both set of quantiles came from the same distribution, we should see the points forming a line that is roughly straight.

LAG LENGTH SELECTION CRITERION RESULTS:

Table no. 2

VAR system, maximum lag order 12

The asterisks below indicate the best (that is, minimized) values of the respective information criteria, AIC = *Akaike criterion*, BIC = *Schwarz Bayesian criterion* and HQC = *Hannan-Quinn criterion*.

lags	loglik	p(LR)	AIC	BIC	HQC
1	2511.04102		-27.874754*	-26.572671*	-27.346592*
2	2557.69454	0.00984	-27.676509	-25.217018	-26.678869
3	2599.08269	0.05727	-27.418088	-23.801190	-25.950971
4	2646.65025	0.00699	-27.230289	-22.455983	-25.293694
5	2687.31191	0.07089	-26.963565	-21.031852	-24.557493
6	2738.77635	0.00146	-26.820301	-19.731181	-23.944752
7	2800.22766	0.00001	-26.791173	-18.544645	-23.446147
8	2864.21905	0.00000	-26.791075	-17.387139	-22.976571
9	2939.38299	0.00000	-26.918663	-16.357320	-22.634681
10	3016.52877	0.00000	-27.068900	-15.350150	-22.315441
11	3074.57972	0.00007	-27.000911	-14.124753	-21.777975
12	3138.16543	0.00000	-26.996176	-12.962611	-21.303763

Selection of Lag length is one of the pre-requsites of time series analysis(Gujarati and Sangeetha, 2008; 672)[27].The analysis in Cavaliere and Taylor (2008[28], 2009[29]) is based on the use of a lag length in the augmented Dickey-Fuller [ADF] test regression which is a deterministic function of the sample size. For annual data we may consider one or two lags, while for monthly data number of lags could be extended upto 12 lags (Gujarati, 2011; 214)[30]. Such large numbers of lags could be reduced with the help of statistical criterions like Akaike Information Criteria (AIC), Hannan – Quinn Information Criteria (HQC) or Schwarz Bayesian Information Criteria (BIC), etc. For testing the unit roots of the variables at level, two criterions for lag selection have been used i.e. AIC and BIC, which reports similar lag length for ADF unit root test. Table 3 reports the results of ADF unit root test on the variables for stationarity at levels.

ADF UNIT ROOT TEST RESULTS:

Table no. 3

Unit Root Test: ADF unit root test
Unit-root null hypothesis: a = 1
OLS, using observations 2005:11-2021:04 (T = 186)
Testing down from 1 lag, criterion AIC

Series	Test Statistics	p-value	Ho = Accept / Reject	Stationarity
BSEreturn	−12.95 (1)	1.88e-021*	Reject	Stationary (no unit root)
FMCGreturn	−10.90 (1)	3.98e-022*	Reject	Stationary (no unit root)
FINreturn	−12.30 (1)	2.15e-020*	Reject	Stationary (no unit root)
INDreturn	−10.98 (1)	5.94e-018*	Reject	Stationary (no unit root)
ITreturn	−8.457 (1)	2.18e-014*	Reject	Stationary (no unit root)
OILnGreturn	−13.44 (1)	3.62e-022*	Reject	Stationary (no unit root)
POWRreturn	−12.31 (1)	2.10e-020*	Reject	Stationary (no unit root)
TELreturn	−14.90 (1)	6.94e-024*	Reject	Stationary (no unit root)

Notes: (1) *indicates significance at 1 % level, representing rejection of Null hypothesis of unit root.
(2) The figures within parenthesis are lag lengths.

An Augmented Dickey Fuller (ADF) statistic test the null hypothesis that a unit root is present in a time series sample. The ADF statistic, used in the test, is a negative number. The more negative it is, the stronger the rejections of the hypothesis that there is a unit root at same level of confidence.

Stationarity means that the statistical properties of a time series (or rather the process generating it) do not change over time.

Stationarity is important because various vital analytical tools and test and models are relying on it for logical interpretations of the data set used.

ADF Hypothesis Testing Rule:

- If t value >ADF critical values = Accept null hypothesis i.e., Unit root exists, mean data is non stationary.
- If t < ADF critical value = Reject null hypothesis i.e., Unit root does not exist, mean data is stationary.

Table no. 4:
Granger Causality test:

	Hypothesis	Observations	Test statistics	p-value
HYPOTHEIS NO. 1	*BSEreturn does not Granger-cause FMCGreturn*	F (1, 177)	0.0059587	0.9386
	FMCGreturn does not Granger-cause BSEreturn		0.043942	0.8342
	BSEreturn does not Granger-cause FINreturn	F (1, 177)	0.026333	0.8713
	FINreturn does not Granger-cause BSEreturn		0.066015	0.7975
	BSEreturn does not Granger-cause INDreturn	F (1, 177)	2.1156	0.1476
	INDreturn does not Granger-cause BSEreturn		0.037056	0.8476
	BSEreturn does not Granger-cause ITreturn	F (1, 177)	0.046943	0.8287
	ITreturn does not Granger-cause BSEreturn		0.3695	0.5441
	BSEreturn does not Granger-cause OILnGreturn	F (1, 177)	0.66892	0.4145
	OILnGreturn does not Granger-cause BSEreturn		0.093417	0.7602
	BSEreturn does not Granger-cause POWRreturn	F (1, 177)	0.036508	0.8487
	POWRreturn does not Granger-cause BSEreturn		0.1539	0.6953
	BSEreturn does not Granger-cause TELreturn	F (1, 177)	0.3024	0.5831
	TELreturn does not Granger-cause BSEreturn		0.2488	0.6185
HYPOTHESIS NO. 2	*FMCGreturn does not Granger-cause FINreturn*	F (1, 177)	0.96655	0.3269
	FINreturn does not Granger-cause FMCGreturn		0.054112	0.8163
	FMCGreturn does not Granger-cause INDreturn	F (1, 177)	2.4736	0.1176
	INDreturn does not Granger-cause FMCGreturn		0.14076	0.7080
	FMCGreturn does not Granger-cause ITreturn	F (1, 177)	0.47413	0.4920
	ITreturn does not Granger-cause FMCGreturn		1.2461e-007	0.9997
	FMCGreturn does not Granger-cause OILnGreturn	F (1, 177)	**4.7849**	**0.0300***
	OILnGreturn does not Granger-cause FMCGreturn		0.02472	0.8752
	FMCGreturn does not Granger-cause POWRreturn	F (1, 177)	0.0066227	0.9352
	POWRreturn does not Granger-cause FMCGreturn		0.93956	0.3337
	FMCGreturn does not Granger-cause TELreturn	F (1, 177)	**3.691**	**0.0563****
	TELreturn does not Granger-cause FMCGreturn		0.03469	0.8525
	FINreturn does not Granger-cause INDreturn	F (1, 177)	**3.5334**	**0.0618****
	INDreturn does not Granger-cause FINreturn		0.04225	0.8374
	FINreturn does not Granger-cause ITreturn	F (1, 177)	0.4253	0.5152
	ITreturn does not Granger-cause FINreturn		0.039508	0.8427
	FINreturn does not Granger-cause OILnGreturn	F (1, 177)	1.0363	0.3101
	OILnGreturn does not Granger-cause FINreturn		1.0977	0.2962
	FINreturn does not Granger-cause POWRreturn	F (1, 177)	0.076607	0.7823
	POWRreturn does not Granger-cause FINreturn		0.16525	0.6849
	FINreturn does not Granger-cause TELreturn	F (1, 177)	0.53579	0.4651
	TELreturn does not Granger-cause FINreturn		0.81438	0.3681
	INDreturn does not Granger-cause ITreturn	F (1, 177)	0.03224	0.8577
	ITreturn does not Granger-cause INDreturn		1.8067	0.1806
	INDreturn does not Granger-cause OILnGreturn	F (1, 177)	0.54591	0.4610
	OILnGreturn does not Granger-cause INDreturn		0.69559	0.4054
	INDreturn does not Granger-cause POWRreturn	F (1, 177)	0.027023	0.8696

	POWRreturn does not Granger-cause INDreturn		1.8301	0.1778
	INDreturn does not Granger-cause TELreturn	F (1, 177)	0.4353	0.5103
	TELreturn does not Granger-cause INDreturn		1.2693	0.2614
	ITreturn does not Granger-cause OILnGreturn	F (1, 177)	0.0017553	0.9666
	OILnGreturn does not Granger-cause ITreturn		1.1604	0.2828
	ITreturn does not Granger-cause POWRreturn	F (1, 177)	0.04226	0.8374
	POWRreturn does not Granger-cause ITreturn		0.34936	0.5552
	ITreturn does not Granger-cause TELreturn	F (1, 177)	0.057737	0.8104
	TELreturn does not Granger-cause ITreturn		0.26342	0.6084
	OILnGreturn does not Granger-cause POWRreturn	F (1, 177)	0.147	0.7019
	POWRreturn does not Granger-cause OILnGreturn		0.58742	0.4444
	OILnGreturn does not Granger-cause TELreturn	F (1, 177)	0.048681	0.8256
	TELreturn does not Granger-cause OILnGreturn		0.026471	0.8709
	POWRreturn does not Granger-cause TELreturn	F (1, 177)	0.63436	0.4268
	TELreturn does not Granger-cause POWRreturn		0.57538	0.4491

Note: * = significant at 5 % level of significance
** = significant at 10% level of significance

Interpretation of Granger Causality test:

It is a statistical concept of causality based on prediction. According to Granger, if a signal X_1 "Granger Cause" (or G- Cause) a Signal X_2, then past values of X_1 should contain information that helps to predict X_2 above and beyond the information contained in past values of X_2 alone. It is a mathematical formulation based on linear regression modeling of stochastic processes (Granger, 1969)[31]. Granger Causality is a method to examine the causality between two variables in a time series. "Causality" is related to cause-and-effect notion, although it is not exactly the same. When Y granger causes X and X granger causes Y, this is known as bi-directional granger causality. If one only variable granger causes another variable, it is Uni-directional granger causality. If both variables are independent of each other than there is no causality.

Null Hypothesis: Lagged X-values do not explain the variation in Y (X(t) doesn't granger cause Y(t))

Alternative Hypothesis: Lagged X-values explain the variation in Y (X(t) granger cause Y(t))

Null Hypothesis No. 1: The variables return performance do not granger cause BSE return i.e., there is no causal relationship between return of variables (*FMCGreturn*, *OILnGreturn*, *TELreturn*, *POWRreturn*, *FINreturn*, *INDreturn*, *ITreturn*) and BSE return variable.

Null Hypothesis No. 2: The variables return performance does not granger cause each other return i.e., there is no causal relationship between variables (*FMCGreturn*, *OILnGreturn*, *TELreturn*, *POWRreturn*, *FINreturn*, *INDreturn*, *ITreturn*).

Granger causality, or precedence, is a circumstance in which one time- series variable consistently and predictably changes before another variable (Granger, 1969)[32]. Granger causality is important because it allows us to analyze which variable precedes or leads the other, and as such leading variables are extremely useful for forecasting purposes (Studenmund, 2013)[33]. This helps in identifying whether a change in any one of the three variables has caused a change in the other two variables or not.

Findings of the Granger Causality test (table no 4) for Hypothesis no 1 reveals that there is no granger causality between returns of the BSE indices and the return of the sectoral indices. However, for sectoral indices return values table 4 reports that there is only three uni-directional granger causality in the variables i.e., *FMCGreturn* causes *OILnGreturn* (at 5 percent level of significance), *FMCGreturn* causes *TELreturn* (at 10 percent level of significance) and *FINreturn* causes *INDreturn* (at 10 percent level of significance). There is no bi-directional granger causality has been reported by the applied model.

Based on the above information, the hypothesis no. 1 cannot be rejected which specifies that there is no causality relationship between BSE return and sectoral indices return. In case of hypothesis no. 2 also the null hypothesis primarily cannot be rejected, as there is no conclusive granger-cause effect is noticeable in the study. However, for three uni-directional effect related to the variables *FMCGreturn* (Fast Moving Consumer Goods sectoral return), *OilnGreturn* (Oil and Gas Sectoral return), *TELreturn* (Telecom sector indices return), *FINreturn* (Finance sector Indices return) and *INDreturn* (Industry sectoral return), the null hypothesis cannot be accepted. The Information Technology sector (*ITreturn*) and Power sector (*POWRreturn*) is found to be totally independent of other sectors.

CONCLUSION:

Bombay Stock Market is tended to be believed as more volatile in comparison to other stock markets of the world (Kannan and Jesiah, 2019)[34]. Based on the statement given, the present study becomes more relevant and vital for investors decision making. The study helps to determine the performance of different sectoral indices and thereby helping the investors in making more investment friendly decisions. This paper attempted to study the relationship between selected sectors indices return and calculated Bombay stock exchange return. Low degree of relationship between the return of different sectors and BSE return indicates that market is good for diversification of portfolio, which ultimately helps the investors to attain return and minimize the risk of investing in the stock market. Under the given result of the study, investing in a wide range of investment in different sectoral indices will reduce the chance of losing substantial / entire amount of investment.

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