Dynamic linkage between nifty-fifty and sectorial indices of national stock exchange

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Abstract: The main objective of this paper is to analyze the trend and pattern of the Nifty-Fifty and sectorial indices. An attempt has been also made to find out the causal relationship among the Nifty-Fifty and NSE sectorial Indices. The unit root test and Granger-causality test has been applied to check the causal relationship between Nifty-Fifty and sectorial indices. The finding of the study shows that the financial service sector had performed better and followed by the banking sector among all the indices while the Pharma sector and the Realty sector were Under-performed in comparison to other indices. The Nifty-Fifty has been found less volatile in comparison to other sectorial indices however Realty sector indices show the highest volatility during the study period.

Keywords: Granger Causality; Johansen Co-integration; Nifty-Fifty; Sectorial Indices.

Introduction

Globalization and finance-related sector changes in emerging economies have introduced a huge change in the finance-related engineering of the economies. In the contemporary situation, the exercises in the monetary markets and their connections with the genuine division have expected huge significance. Investment decision in the stock market is always subject to a close inspection of risk-return characteristics. The investors would prefer stocks of those sectors which provide a

maximum return with a minimum level of risk. Modern portfolio theory suggests that investors should construct a portfolio of multiple assets in order to get a maximum return at a given level of risk (Markowitz, 1952). The securities exchanges of developing economies have been of crucial significance to the worldwide speculation network. Since developing markets are more unstable than the very much created securities exchange, consequently, the developing markets will, in general, be disconnected from each other and with the created markets. Various financial specialists around the world selected to broaden their assets over the developing markets. Securities exchanges of developing economies have as of late been of fundamental significance to worldwide speculation network. The capitalization returns and instability have expanded significantly in these business sectors. Since developing markets are increasingly unstable than the very much created securities exchanges, along these lines, the developing markets will generally be inconsequential with each other and with the developed markets. In the practical context analysis of risk-return aspects, every company looks to be tremendous thanks to the necessity of a huge input file and massive time. With reference to the higher than constraints investors sometimes resort to index models for portfolio choice. Index models propose that the link between a set of securities will indirectly be measured by scrutiny of every security to a standard factor of 'market performance index' (Sharpe, 1963). Sectoral linkage has turned into a discussed point in the portfolio creation process. The investors will, in general, make a portfolio by distributing funding to stocks from diverse sectors. Their allotment is simply subject to the execution and foreseen the development of the concerned sector. The impact of the random walk can likewise impact the stock determination process. It refers that the investors will, in general, contribute with certain stocks dependent on great data from the concerned sector. Furthermore, they continue to amending their portfolio as per the availability of a new piece of information. To the extent, investors are concerned the execution of different divisions can be seen from the individual sectoral indices and convenient portfolio revision can be embraced dependent on index movements. The price movements of stocks in a single division may have an impact on stocks in another area. Understanding this linkage between different parts would extraordinarily help the investors in the portfolio update process. In this study, the observation among the linkage of different sectors (Auto, Bank, IT, Financial Services, FMCG, Media, Metal,

Pharma, Reality with Nifty-Fifty) is assessed in Indian stock market and some recommendations are suggested for the investors to revise portfolio process.

Literature review

Krishanmurty (2002), outlined the selection of econometric models for India, converse about some theoretical and empirical issues applicable to macro-modeling and the use of models in predicting, policy analysis and planning and, at last, set out the schedule for future work in the line. Farooq and Keung (2004), analyzed the relationship among indices of stock in the Karachi Stock Exchange (KSE) with the exchange rate. The results of the study found that no co-integrated relationship between the stock market indices and exchange rate but a causal relationship underlies between the exchange rate and a general index of the stock market. Sarkar (2009), investigated the volatility between the Indian stock market and domestic sectoral indices. The results revealed Granger Causal volatility in the developed market indices. Tiwari and Islam (2012), analyzed eight stock indices from the Bombay Stock Exchange (BSE) by implementing non- parametric unit root test and cointegration test on a data from 23rd August 2004 to 31 June 2010 time period. The results of the study revealed that BSE sectoral indices satisfy the weak efficiency forms and diversification benefits were enormous within the indices. Debnath and Roy (2012), analyzed state domestic product and inter-sectorial linkage trends in sectoral share of north-east India from the time period of 1987 to 2007. The study concluded that there were short-run bidirectional and long-run unidirectional causality in indices. Howe et.al (2012), examined the long term equilibrium relationship between selected macroeconomic variables and indices of Singapore Stock Exchange (SSE). The results of the study concluded that Singapore's stock market and property index formed a short term relationship and other selected indices formed a long term relationship. Vardhan (2015), investigated the long run, short-run and causality relationships between eight identified sector indices and Sensex for the post subprime period in the Indian industry by using Vector Error Correction Model (VECM) for econometric analysis. The results of the study revealed that Limited lead-lag short-run relationships between sector indices were observed and banking index played a predominant and integrating role in moving other indices. Singhal and Ghosh (2016), investigated the time-varying co-movements among crude oil and Indian stock market returns both at aggregate and sector level from the period of 1 January 2006 to February 2008, 2015. The results of the study

revealed that direct volatility spillover to Indian Stock market from the oil market was not significant. Aravind (2017), explored co-movements of twelve NSE sectoral indices and Nifty on a daily basis with the help of the granger causality test for a time period from January 2012 to December 2016. The results of the study revealed that private sector bank and Nifty had a strong bidirectional linkage but IT and FMCG had a significant unidirectional linkage with Nifty.

Objectives and methodology

1. Objectives of the study

This study has done to achieve the followings objectives:

- ➢ To analyze the trend and pattern of Nifty-Fifty and sectorial indices.
- ➢ To compare the performance of Nifty-Fifty and sectorial indices.
- ➢ To examine the causal relationship between Nifty-Fifty and sectorial indices.

2. Hypotheses

- ➢ Null Hypothesis (H0): There is no significant relationship between Nifty-Fifty and sectorial indices.
- ➢ Alternative Hypothesis (H1): There is a significant relationship between Nifty-Fifty and sectoral indices

3. Sampling and source of data

In order to examine the performance of Indian stock indices the secondary data has been collected from various sources like national stock exchange, moneycontrol.com and other relevant websites for a period of five years from January 2014 to December 2018. The ten sectoral indices of National stock exchange out of fifteen sectorial indices have been selected for this study. The selected sectoral indices are Nifty-Fifty, Nifty Financial Services, Nifty FMCG, Nifty IT, Nifty Media, Nifty Auto, Nifty Bank, Nifty Metal, Nifty Pharma and Nifty Realty.

4. Statistical tools used for analysis

The data has been analyzed with the help of various statistical tools like M-S Excel, E-Views and Stata. To evaluate the performance of indices average daily return mean, median, standard deviation, skewness, kurtosis, and Jarque-Bera have been calculated for all series. All the observation of all the indices has been checked for non-stationary of the data using by Unit root test

(Augmented Dickey-Fuller). Granger causality test has been applied to determining cause-effect relationships among all the series.

Data analysis and findings

Table 1: Descriptive statistics of calculated daily return of Nifty-Fifty and Sectoral Indices

Parameters	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	P-Value
Nifty 50	0.0478	0.0624	3.3669	-5.9151	0.8455	-0.4454	5.7032	415.8561	.0000
Fin. Ser.	0.0789	0.0617	5.2024	-6.5468	1.1244	-0.0583	5.1025	227.6137	.0000
FMCG	0.0526	0.0650	5.3754	-6.7322	1.0305	-0.3332	6.2014	548.9006	.0000
IT	0.0404	0.0396	4.7983	-4.7967	1.1052	-0.1459	4.7206	156.3359	.0000
Media	0.0376	0.061	5.4996	-8.0501	1.3129	-0.1180	5.1192	233.393	.0000
Auto	0.0517	0.1131	4.4759	-7.2569	1.1436	-0.3211	5.5511	355.2415	.0000
Bank	0.0775	0.0654	5.4696	-6.897	1.1751	0.0399	5.2973	271.2414	.0000
Metal	0.0321	0.0214	9.8422	-7.0458	1.6172	0.0366	4.7847	163.7874	.0000
Pharma	0.0195	0.0535	5.2144	-6.9852	1.2365	-0.2370	5.0572	228.7902	.0000
Realty	0.0365	0.1193	8.4295	-11.604	1.9870	-0.3565	6.4647	642.3068	.0000

Source: Author's Calculation

Table 1 contained descriptive statistics such as average mean return, median, standard deviation, skewness, and kurtosis, etc. of Nifty and sectoral indices for the five years ranging from January 2014 to December 2018. From the table, it can be inferred that the financial service sector was generated the highest average daily return with a mean value of 0.0789 and followed by the banking sector 0.0775. On the other hand, the Pharma sector contributes the lowest average return of 0.0195 among all the indices. Nifty generated the 0.0478 average daily returns during the study period. Financial services (0.0789), Bank (0.0775), FMCG (0.0526), and Auto (0.0517) sector indices were out-performed in comparison to Nifty whereas IT (0.0404), Media (0.0376) Realty (0.0365), Metal

(0.0321), Pharma (0.0195) and Realty (0.0365) were Under-performed respectively. Standard deviation measured the magnitude of fluctuations (Volatility) which are considered as a degree of risk of assets. The Nifty has recorded the lowest value of standard deviation (0.8455) which means that Nifty was less volatile in comparison to other sectoral indices. Realty sector indices show the highest volatility whereas FMCG (1.0305) sector recorded the lowest value of standard deviation. Skewness and Kurtosis shows the distribution of the data. The bank and Metal sector indices were positively skewed but other indices were negatively skewed. Also, Kurtosis (which refers to the degree of flatness at the top of the distribution) of all the indices series is more than three so series is peaked. Further, from the table, it can be seen that the data was not normal as the p-values of Jarque-Bera Statistics for all the values were less than 0.05.

2. Unit Root Test Results

Table 2: Unit Root Test Results for the calculated daily return of Nifty-Fifty and Sectoral Indices

INDICES	ADF t statistic	Critical value* At significant level			p value	Null Hypothesis**
		1 %	5%	10%		
Nifty 50	-32.49	-3.436657	-2.864213	-2.568245	.000	Rejected
Fin. Ser.	-32.57	-3.436657	-2.864213	-2.568245	.000	Rejected
FMCG	-32.87	-3.436657	-2.864213	-2.568245	.000	Rejected
IT	-33.27	-3.436657	-2.864213	-2.568245	.000	Rejected
Media	-34.11	-3.436657	-2.864213	-2.568245	.000	Rejected
Auto	-34.02	-3.436657	-2.864213	-2.568245	.000	Rejected
Bank	-33.48	-3.436657	-2.864213	-2.568245	.000	Rejected
Metal	-34.02	-3.436657	-2.864213	-2.568245	.000	Rejected

Pharma	-31.95	-3.436657	-2.864213	-2.568245	.000	Rejected
Realty	-32.64	-3.436657	-2.864213	-2.568245	.000	Rejected

Note: *MacKinnon(1996) critical values, ADF Augmented Dickey Fuller Test statistics, **Null Hypothesis: The series has Unit root or non-stationarity.

We test properties of all indices series whether they are stationarity or not. If there are shocks present in the series then it will be non-stationary time series. Therefore, to identify the shock present in our data we need to apply Augmented Dickey-Fuller unit root tests (ADF Test). The null hypothesis supposed that the data series has a unit root or non-stationarity. Table 2 presents the results of the Augmented Dickey-Fuller unit root test for average daily return of Nifty-Fifty and other sectoral indices at level with constant only. The results indicate that the coefficient of lagged Nifty was negative. Also, its p-value was less than 0.05. This confirmed that the unit root test model was valid and it was suitable to ascertain the stationarity of the data. The p-value of the Augmented Dickey-Fuller test was 0.00 for all the indices which were less than 0.05. So, we rejected the null hypothesis that the average daily return of Nifty-Fifty and other sectorial indices had unit root or non-stationery. Hence, it was confirmed that data for the average daily return of Nifty-Fifty and other sectorial indices was stationary and it could be used for further analysis.

3. Results of Granger Causality Test

Granger (1969) proposed a time-series data-based approach in order to determine causality. Granger causality test shows the relationship of precedence among variables. This test will help in finding the answer to whether X causes Y. Y is said to be granger caused by X if X helps in the prediction of Y. It is applied to the stationary series. We take the null hypothesis as X doses not granger cause of Y and vice versa. Before applying to this test the optimal lag must be selected because the results are very sensitive to the number of lags used in the analysis. This study adopts the Schwartz information criterion (SIC) in which lag 4 is found to be the optimal lag for the total time periods. Table 3 presents the results of the Granger Causality test. From the table, it can be inferred that the auto sector has one-way Granger causality to the IT sector as the probability value (0.04) is less than a five percent significant level. The banking sector can granger cause to Auto, Financial Services, Media, Metal and Realty sector as the p-value 0.01, 0.00, 0.00, 0.00 & 0.02. The result

indicates that the banking sector has a bidirectional relationship with the financial services sector and metal sector. The financial sector is found to have a unidirectional causal relation with Auto, media, metal and Reality sectors with significant probability values of 0.00, 0.00, 0.01 and 0.03 respectively. The financial sector has a bidirectional relationship with the banking sector. The metal sector can granger cause to Auto, Banking, and Nifty Fifty with p-value (0.03, 0.03 & 0.03). The metal sector has a bidirectional relationship with the banking sector and Nifty Fifty. The Pharma sector can granger cause to the Banking sector, financial services and nifty fifty as the calculated probability value is 0.00, 0.02 and 0.01. Granger causality test also shows that nifty movements can notably influence media, and metal sector with consequent probabilities of 0.03, and 0.01. In addition to this, there is no linkage was observed between FMCG, IT and Media sector with all other sectoral indices.

Conclusion and suggestion

Stock market indices are calculated with references to a base period and a base index value. Sectorial linkage has become a debated topic in the portfolio creation process so knowledge on sectoral inter-connection can play an important role in portfolio reallocation. The Nifty-Fifty has been found less volatile in comparison to other sectorial indices however Realty sector indices show the highest volatility during the study period. Risk-averse investors can choose for shares from FMCG sectors as it showed lesser volatility during the period of study. Granger causality test also has been applied to examine the cause and effect relationship. The test results found the evidence of uni-directional linkage between Auto-IT banking-Auto, banking-financial services, banking-media, banking-metal, banking-reality sector. The financial sector is found to have a unidirectional causal relation with Auto, media, metal and Reality sectors. The metal sector, granger cause to Auto, Banking, and Nifty Fifty. The Pharma sector can granger cause to the Banking sector, financial services, and Nifty Fifty. The Nifty movements can notably influence the media, and metal sector. The result also shows that there is no linkage between FMCG, IT and Media sector with all other sectoral indices. A significant bi-directional relation can be recognized with banking to financial services and metal sector to the banking sector and Nifty Fifty. The understanding of this linkage among various sectors will help to the portfolio managers and investors in fund investment

and re-allocation process. After considering the significance and extent of linkage among various sectors investors can properly manage their fund.

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ANNEXURE

Table 3: Results of Granger Causality For daily average return of indices

Var.(X) → Var.(Y)↓		Auto	Bank	F. Services	FMCG	IT	Media	Metal	Pharma	Reality	Nifty Fifty
Auto	F-Statistics		3.93	4.65	0.29	0.00	0.07	3.15	1.81	0.74	1.82
	p- value		0.01	0.00	0.74	0.09	0.92	0.03	0.16	0.47	0.16
Bank	F-Statistics	0.06		3.12	0.03	0.39	0.08	3.51	4.79	2.17	0.84
	p- value	0.93		0.04	0.96	0.67	0.91	0.03	0.00	0.11	0.43
F. Services	F-Statistics	0.47	5.02		0.04	0.38	0.08	1.70	3.74	0.24	0.19
	p- value	0.62	0.00		0.95	0.67	0.91	0.18	0.02	0.77	0.82
FMCG	F-Statistics	1.69	0.7	0.33		1.31	1.43	1.52	0.21	0.61	0.68
	p- value	0.18	0.49	0.71		0.26	0.23	0.21	0.80	0.53	0.50
IT	F-Statistics	2.87	0.30	1.04	0.27		2.70	0.25	0.06	2.17	1.05
	p- value	0.04	0.73	0.35	0.75		0.06	0.77	0.93	0.11	0.21
Media	F-Statistics	1.53	5.09	5.39	0.45	1.99		0.52	1.42	2.56	3.41
	p- value	0.21	0.00	0.00	0.63	0.33		0.59	0.24	0.07	0.03
Metal	F-Statistics	1.34	4.97	4.43	1.35	0.06	1.39		2.46	1.44	3.97
	p- value	0.26	0.00	0.01	0.25	0.93	0.24		0.08	0.23	0.01
Pharma	F-Statistics	1.13	1.18	0.84	1.08	2.23	0.90	1.27		0.76	1.31
	p- value	0.32	0.30	0.42	0.33	0.10	0.40	0.28		0.46	0.26
Reality	F-Statistics	2.34	3.72	3.38	1.23	0.66	1.51	0.19	1.95		2.16
	p- value	0.09	0.02	0.03	0.29	0.51	0.22	0.82	0.14		0.11
Nifty-Fifty	F-Statistics	1.99	0.95	1.17	0.06	0.19	0.21	3.24	3.94	0.02	
	p- value	0.13	0.38	0.30	0.93	0.82	0.80	0.03	0.01	0.97	

Note: Significant level at 5%