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Potent relationship between the nifty-fifty and national stock exchange sectoral indices

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Abstract

The purpose of this article is to examine the trend and pattern of the Nifty-50 and sectoral indexes. Further, an attempt has also been made to determine the causal link between the Nifty-Fifty and NSE sectoral indices. The unit root test and the Granger-causality test have been applied to investigate the causal link between the Nifty-Fifty and sectoral indices. According to the study's findings, the banking Sector outperformed all other indexes, followed by the information technology sector, while the FMCG and media sectors underperformed. The Nifty-Fifty has been shown to be less volatile than other sectoral indices, although banking sector indices have exhibited the highest volatility over the research period.

Keywords: Granger causality, Johansen co-integration, nifty-fifty, sectoral indices

1. Introduction

Globalization and developments in the finance-related sector in developing nations have brought about significant changes in the financial engineering of the economies. In the current circumstances, the activities in the financial markets and their links with the real sector have assumed enormous significance. Stock market investment decisions are usually subject to a rigorous examination of risk-return characteristics. Investors would pick equities in industries that provide a high return with a low amount of risk. According to modern portfolio theory, investors should build a portfolio of numerous assets in order to maximize their return at a given degree of risk (Markowitz, 1952) [7]. The securities markets of developing economies have been critical to the global speculating network. Because emerging markets are more volatile than the newly formed securities exchange, developing markets will, in general, be separated from each other and from the created markets. Various financial experts from across the world chose to diversify their holdings into developing markets. Securities exchanges in emerging nations have recently become extremely important to the global speculating network. Capitalization returns and volatility have increased based dramatically in these industries. Because emerging markets are more volatile than newly established securities exchanges, developing markets will typically be insignificant in comparison to each other and to existing markets. In the practical context of risk-return analysis, every organization seems to be enormous due to the requirement of a vast input file and gigantic time. With regard to the greater than limitations, investors may turn to index models for portfolio selection. Index models imply that the relationship between a group of securities will be assessed indirectly by comparing each security to a standard factor of a 'market performance index' (Sharpe, 1963) [10]. Sectoral linking has been a hot topic in the portfolio development process. It denotes that, in general investors will contribute certain equities based on extensive data from the relevant sector. Furthermore, they continue to update their portfolio when new information becomes available. To the degree that investors are concerned, the performance of various divisions may be seen through particular sectors indexes, and convenient portfolio adjustment can be welcomed based on index movements. Stock price swings in one division may have an influence on stocks in another. Understanding the relationship between the various elements would be extremely beneficial to investors during the portfolio updating process. The observation of the connectivity of several sectors (Auto, Bank, IT, Financial Services, FMCG, Media,

Metal, Pharma, Realty with Nifty-Fifty) in the Indian stock market is examined in this study, and some recommendations are made for investors to modify their portfolio procedure.

2. Review of Literature and Research Methodology

Krishnamurthy (2002) ^[5] presented the selection of econometric models for India, discussed various theoretical and empirical concerns relevant to macro-modeling and the use of models in forecasting, policy analysis, and planning, and, last, established a timeline for future work in the area. Farooq and Keung (2004) ^[2] investigated the link between stock indices on the Karachi Stock Exchange (KSE) and the exchange rate. The study's findings revealed that there is no co-integrated link between stock market indices and exchange rates, but a causal association exists between the exchange rate and a generic stock market index. Sarkar (2009) ^[9] explored the correlation between the volatility of the Indian stock market and domestic sectoral indexes. Granger Causal volatility was discovered in developed market indices. Tiwari and Islam (2012) ^[14] examined eight stock indexes from the Bombay Stock Exchange (BSE) using a non-parametric unit root test and a cointegration test on data from August 23, 2004 to June 31, 2010. The study's findings demonstrated that BSE sectoral indices fulfil the low efficiency forms, and the indices' diversification effects were considerable. Debnath and Roy (2012) ^[1] examined developments in state domestic product and inter-sectorial connection in the sectoral share of north-east India from 1987 to 2007. The study concluded that indices had both short-run bidirectional and long-run unidirectional causation. Howe *et al.* (2012) investigated the long-term equilibrium link between selected macroeconomic factors and Singapore Stock Exchange indices (SSE). According to the study's findings, Singapore's stock market and property index have a short-term association, whereas other chosen indices have a long-term relationship. Vardhan (2015) ^[15] used the Vector Error Correction Model (VECM) for econometric research to study the long run, short run, and causation links between eight identified sector indexes and the Sensex during the post-subprime period in the Indian business. The study's findings demonstrated that there were limited lead-lag short-run correlations across sector indices, and the banking index had a dominant and integrative role in moving other indices. Singhal and Ghosh (2016) ^[13] examined the time-varying co-movements of crude oil and Indian stock market returns at the aggregate and sector levels from January 1, 2006 to February 8, 2015. The study's findings found that the direct volatility spillover from the oil market to the Indian stock market was insignificant. Aravind

(2017) ^[6] used the granger causality test to examine the daily co-movements of twelve NSE sectoral indices and the Nifty from January 2012 to December 2016. The study's findings found that private sector banks and Nifty had a strong bidirectional relationship, although IT and FMCG had a considerable unidirectional relationship with Nifty. The primary goal of this article is to examine the trend and pattern of the Nifty50 and sectoral indexes. An attempt has also been made to determine the causal link between the Nifty-Fifty and NSE sectorial indices. The unit root test and the Granger-causality test were used to investigate the causal link between the Nifty-Fifty and sectoral indices. Vinod Kumar, Kamaljit Singh (2020) ^[16] The study's findings suggest that the financial services industry did the best, followed by the banking industry ranked first across all indexes, followed by the pharmaceutical and real estate sectors. In contrast to other indices, it underperformed. The Nifty-Fifty has been discovered to be less volatile However when compared to other sector indexes, the Realty sector indices exhibit the largest volatility.

2.1 Objectives and methodology

The present study has been conducted with the following objectives:

1. To investigate the trend and pattern of the Nifty-Fifty and sectoral indexes.
2. To assess the performance of the Nifty-Fifty and sectoral indexes.
3. To investigate the link between the Nifty-Fifty and sectoral indexes.

2.2. 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.

2.3. Statistical tools used for analysis: Secondary data was obtained from multiple sources such as the national stock market, www1.nseindia.com, and other relevant websites to assess the performance of Indian stock indexes during a five-year period from January 2017 to December 2021. For this study, 12 sectoral indices from the National Stock Exchange were chosen from a pool of Seventeen. Nifty-Fifty, Nifty Financial Services, Nifty FMCG, Nifty IT, Nifty Media, Nifty Auto, Nifty Bank, Nifty Metal, Nifty Pharma, Nifty Private Bank, Nifty PSU bank and Nifty Realty are the sectors indexes chosen.

Table 1: Descriptive statistical results of Nifty-Fifty and Sectoral Indices by using daily return

Param eters	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis	Jarque-Bera	P-Value
Nifty 50	0.065191	0.123487	6.475114	-8.655071	0.941376	-0.906483	17.61218	11192.44	.0000
Fin. Serve.	0.076190	0.110838	9.017043	-11.41053	1.240941	-0.590776	17.20800	10493.48	.0000
FMCG	-0.036625	0.060760	64.28891	-155.3289	4.855052	-24.56467	871.0893	39028127	.0000
IT	0.111904	0.109291	5.424670	-6.309482	1.047003	-0.421545	8.442627	1565.941	.0000
Media	-0.002367	0.011808	9.771667	-7.966325	1.467889	-0.051772	8.908542	1802.827	.0000
Auto	0.021353	0.079636	8.633538	-10.05344	1.215162	-0.443559	13.95216	6233.037	.0000
Bank	0.199928	0.091671	240.3926	-70.74368	7.240794	28.73201	986.3381	50089462	.0000
Metal	0.069347	0.076756	6.880227	-8.176872	1.463281	-0.515296	6.117365	556.5219	.0000
Pharma	0.032579	0.025389	10.23993	-6.677483	1.104182	0.535701	11.54419	3828.048	.0000
Realty	0.099097	0.181336	8.428246	-9.075674	1.558649	-0.334943	6.866220	794.8393	.0000
Private Bank	0.056479	0.091283	10.13064	-12.82423	1.356270	-0.440347	18.44825	12360.26	.0000
PSU Bank	0.002932	-0.064283	21.92925	-11.30201	1.818447	1.354132	22.45552	19919.61	.0000

Source: Author's calculations

3. Results and Discussion

Table 1 shows the results of descriptive statistics for the Nifty and sectoral indices, such as average mean returns, median, standard deviation, skewness, and kurtosis, over the five-year period from January 2017 to December 2021. From the table, it can be inferred that the Banking sector generated the highest average daily return with a mean value of (0.199928) and followed by the IT sector (0.111904). On the other hand, the FMCG sector contributes the lowest average return of (-0.036625) among all the indices. Nifty generated the 0.065191 average daily returns during the study period. Banking sector 0.199928, IT sector (0.111904), Realty sector (0.099097), Financial services (0.076190) and Metal sector (0.069347) sector indices were out-performed in comparison to Nifty whereas Private bank (0.056479), Pharma (0.032579), Auto (0.021353), PSU Bank (0.002932) FMCG (-0.036625) and Media (-

0.002367), 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 (0.941376) which means the Nifty was less volatile in comparison to other sectoral indices. Bank sector indices show the highest volatility (7.240794) whereas the IT (1.047003) sector recorded the lowest value of standard deviation. Skewness and Kurtosis show the distribution of the data. The bank, Pharma and PSU Bank 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 the 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.

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

INDICES	ADF t statistic	Critical value* At the significant level			p-value	Null Hypothesis**
		1%	5%	10%		
Nifty 50	-10.95261	-3.435519	-2.863710	-2.567976	0.0000	Rejected
Fin. Serve.	-11.15418	-3.435519	-2.863710	-2.567976	0.0000	Rejected
FMCG	-12.85551	-3.435519	-2.863710	-2.567976	0.0000	Rejected
IT	-13.02426	-3.435510	-2.863706	-2.567973	0.0000	Rejected
Media	-11.90207	-3.435514	-2.863708	-2.567974	0.0000	Rejected
Auto	-12.79288	-3.435514	-2.863708	-2.567974	0.0000	Rejected
Bank	-13.51934	-3.435514	-2.863708	-2.567974	0.0000	Rejected
Metal	-12.47748	-3.435514	-2.863708	-2.567974	0.0000	Rejected
Pharma	-12.63162	-3.435510	-2.863706	-2.567973	0.0000	Rejected
Realty	-12.15918	-3.435510	-2.863706	-2.567973	0.0000	Rejected
Private Bank	-11.13248	-3.435519	-2.863710	-2.567976	0.0000	Rejected
PSU Bank	-12.19142	-3.435510	-2.863706	-2.567973	0.0000	Rejected

Source: Author's calculations

The researcher tests the properties of all indices whether they have stationarity or not. If the series contains shocks, it will be a non-stationary time series. Therefore, to identify the shock placed 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 the average daily return of Nifty-Fifty and other sectoral indices at a 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 sectoral indices had unit root or non-stationarity. Hence, it was confirmed that data for the average daily return of Nifty-Fifty and other sectoral indices was stationary and could be used for further analysis.

Annexure

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

Var.(X)		Auto	Bank	F-Services	FMCG	IT	Media	Metal	Pharma	Realty	Private bank	PSU bank	Nifty-Fifty
Auto	F-statistics		1.653	3.5582	0.3132	5.5142	13.634	7.3746	16.476	5.6057	7.334	10.609	4.8999
	P-Value		0.159	0.0068	0.8693	0.0002	7.E-11	7.E-06	4.E-13	0.0002	8.E-06	2.E-08	0.0002
Bank	F-statistics	0.5089		0.0950	0.0235	1.1923	0.5842	0.5578	0.3686	0.6032	0.1448	0.2502	0.2186
	P-Value	0.7292		0.9841	0.0302	0.3124	0.6742	0.6934	0.8311	0.6604	0.9653	0.9096	0.9282
F-Services	F-statistics	7.7754	1.4121		0.3850	7.2279	16.181	10.250	27.181	9.6659	4.0499	12.438	1.3450
	P-Value	3.E-06	0.2277		0.8195	9.E-06	6.E-13	4.E-08	1.E-21	1.E-07	0.0029	6.E-10	0.2512
FMCG	F-statistics	0.2717	0.0302	0.0623		0.0704	0.1543	0.4082	0.5840	0.2798	0.0299	0.3750	0.0319
	P-Value	0.8963	0.9982	0.9928		0.9910	0.9611	0.8028	0.6743	0.8911	0.9983	0.8266	0.9980
IT	F-statistics	13.363	0.0499	11.166	0.4439		12.386	15.735	16.539	15.963	10.983	16.064	6.1234
	P-Value	1.E-10	0.9953	7.E-09	0.7769		7.E-10	1.E-12	3.E-13	1.E-12	9.E-09	8.E-13	7.E-05
Media	F-statistics	0.2516	1.9214	2.4770	0.7033	1.7384		0.8002	4.6243	1.6673	2.7738	2.0739	3.8026
	P-Value	0.9087	0.1045	0.0426	0.5897	0.1391		0.5251	0.0010	0.1552	0.0260	0.0820	0.0044
Metal	F-statistics	4.0888	0.9031	3.0273	0.4063	6.2405	4.3729		12.367	3.8570	4.0678	5.2123	0.54203
	P-Value	0.0027	0.4613	0.0169	0.8042	6.E-05	0.0016		7.E-10	0.0040	0.0028	0.0004	0.7049

Pharma	F-statistics	0.7080	0.6873	3.4146	0.8424	1.9847	3.7063	3.1958		1.8835	3.8072	4.5225	2.1288
	P-Value	0.5865	0.6008	0.0087	0.4983	0.0946	0.0053	0.0127		0.1110	0.0044	0.0012	0.0751
Reality	F-statistics	1.4121	1.5283	0.8314	0.1273	5.5095	7.2679	3.4348	11.075		1.8395	7.4177	0.9909
	P-Value	0.2277	0.1916	0.5052	0.9726	0.0002	9.E-06	0.0084	8.E-09		0.1189	7.E-06	0.4114
Private bank	F-statistics	12.399	1.0076	6.1932	0.2952	11.559	17.857	12.128	31.128	10.634		11.466	3.8113
	P-Value	7.E-10	0.4024	6.E-05	0.8812	3.E-09	3.E-14	1.E-09	1.E-24	2.E-08		4.E-09	0.0044
PSU bank	F-statistics	4.0331	1.0416	1.6847	0.2332	2.3981	4.0040	3.0742	7.7041	5.5440	2.0045		1.9207
	P-Value	0.0030	0.3844	0.1511	0.9197	0.0485	0.0031	0.0156	4.E-06	0.0002	0.0916		0.1046
Nifty-Fifty	F-statistics	14.377	7.3076	7.3077	0.5567	8.2606	17.516	15.876	31.910	13.717	31.128	17.340	
	P-Value	2.E-11	8.E-06	8.E-06	0.6942	1.E-06	5.E-14	1.E-12	3.E-25	6.E-11	1.E-24	8.E-14	

To demonstrate causality, Granger (1969) developed a time-series data-based technique. The Granger causality test demonstrates the precedence connection between variables. This test will be helpful in finding the solution to whether the X variable causes the Y variable. If X helps in the forecasting of Y, Y is said to be granger affected by X. The stationary series is subjected to the granger causality test. The study accepts the null hypothesis, which states that X is not the cause of Y and vice versa. The appropriate lag must be chosen before running this test since the findings are highly sensitive to the number of delays employed in the study. The Schwartz information criterion (SIC) is used in this investigation, and lag 4 is shown to be the best lag for all time periods. The Granger Causality test results are shown in Table 3. The table indicates that the auto sector does have Granger causation to the metal sector and PSU Bank sectors since the probability values 0.0027 and 0.0030 are less than 5% significant. The Financial Services sector can granger cause to Auto, Media, Metal and Pharma sector as the p-value 0.0068, 0.0426, 0.0169 and 0.0087. The result indicates that the Financial Service sector has a bidirectional relationship with the Auto sector and the Pharma sector. The FMCG sector can granger cause to Bank sector as the probability value of 0.0302 is less than 5% significant. The IT sector can granger cause to Auto, Reality, and PSU bank sectors with p-value (0.0002, 0.0002 & 0.0485). The IT sector has a bidirectional relationship with the Auto sector and Reality. The Media sector can granger cause to Metal, Pharma, and PSU Banking sectors with p-value (0.0016, 0.0053 & 0.0031). The Media sector has an almost bidirectional relationship with the Metal, Pharma, and PSU Banking sectors. The Metal sector can granger cause to Pharma, Reality, and PSU Banking sectors with p-value (0.0127, 0.0084 & 0.0156). The Metal sector has a bidirectional relationship with the Pharma and PSU Banking sectors. The Pharma sector can granger cause to Media sectors with the p-value (0.0010). The Reality sector can granger cause to Auto, Metal, and PSU Banking sectors with p-values (0.0002, 0.0040 & 0.0002). The Reality sector has a bidirectional relationship with the Auto and PSU Banking sectors. The Private bank sector can granger cause to the Financial Services, Media, Metal, and Pharma sectors with p-values (0.0029, 0.0260, 0.0028 & 0.0044). The Private bank sector has a bidirectional relationship with the Financial services Metal, and Pharma sectors. The PSU bank sector can granger cause to Metal, and Pharma sectors with p-values (0.0004 and 0.0012). The PSU bank sector has an almost bidirectional relationship with the Metal and Pharma sectors. Granger causality test also shows that nifty movements can notably influence auto, media, and Private bank sectors with consequent probabilities of 0.0002, 0.0044, and 0.0044. The Nifty-Fifty has an almost bidirectional relationship with the Media and Private bank sectors. In addition to this, there is no linkage was observed in the Bank sector with all other sectoral indices.

4. 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 Banking sector indices show the highest volatility during the study period. Risk-averse investors can choose for shares from IT sector 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 metal sector, granger cause to Metal and PSU Banking sector. The Financial Service sector has a bidirectional relationship with the Auto sector and the Pharma sector. The Nifty movements can notably influence the Auto, and media and Private bank sector. The IT sector has a bidirectional relationship with the Auto sector and Reality. The Media sector has an almost bidirectional relationship with the Metal, Pharma, and PSU Banking sectors. The metal sector, granger cause to Pharma, Realty, and PSU Banking sector. The Metal sector has a bidirectional relationship with the Pharma and PSU Banking sectors. The Pharma sector can granger cause to the Media sector. The Realty sector can granger cause to the Auto, Metal PSU Banking sector. The Realty sector has a bidirectional relationship with the Auto and PSU Banking sectors. The Private bank sector has a bidirectional relationship with the Financial services Metal, and Pharma sectors. The PSU bank sector has an almost bidirectional relationship with the Metal and Pharma sectors. Granger causality test also shows that nifty movements can notably influence auto, media, and Private bank sectors. The Nifty-Fifty has an almost bidirectional relationship with the Media and Private bank sectors. A significant bi-directional relation can be recognized with IT to Auto and Realty sector and Realty to Auto and PSU banking sector, PSU banking sector to Metal sector.

In addition to this, there is no linkage was observed in the Bank sector with all other sectoral indices. Understanding the relationship between distinct sectors can aid portfolio managers and investors in the fund investment and re-allocation process. Investors may correctly manage their fund after examining the relevance and level of connectivity among various sectors.

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