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An Analysis of Causality and Cointegration among Nifty Bank Index, Public and Private Sector Banks Share Prices of India.

1.Dr. Santoshkumar, Jaipuria School of Business, Ghaziabad

2 Dr.Lalit Kumar Sharma, Jaipuria School of Business, Ghaziabad

3 Dr.Rajender Kumar, Professor, Department of Commerce, Rajdhani College, DU

Abstract

The current paper examines the long run and short run relationship between the bank nifty and other public and private sector banks listed on NSE. market and banking sector. Bank nifty is a major index on NSE. The data was collected from the official website of National Stock Exchange and invtesing.com. The nature of data used for the purpose is secondary. An empirical analysis using everyday data is conducted for 730 days, starting from 2nd January 2017 to 31st December 2019. Descriptive statistics, Unit root Test, Johansen Cointegration test, Granger Causality Test, Cointegration analysis and Impulse Response function are applied as major methodologies for analysis. Augmented Dickey Fuller Tests is applied to examine stationarity of all the variables, it was found that all the variable series were non stationary. JohnsenCointegration analysis shows that there is no long-term relationship among the variables. Granger Causality /Block Exogeneity test is used to identify the short run relationship and found RET BANK NIFTY, RET HDFC, RET KOTAK and RET ICICI have short run relationship. Impulse response function was also used to check the impact of one shock on another variables.

Keywords--- *Bank Nifty, Johansen Cointegration, Granger Causality, VAR, Impulse Response.*

Introduction

Capital market provides various platform for corporates' and individual investors to raise and invest through alternative instruments. The capital market has majorly two components namely

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equity share market and debt market. National Stock Exchange (NSE) and Bombay Stock Exchange (BSE) dominate Indian equity share market with more than 99% of total trade volumes. NSE was established in 1994, as the first screen based electronic exchange in the country. It is the second largest stock exchange of the world in term of turnover and number of trades in equity shares. The index of NSE is Nifty 50, in which it includes 50 shares large cap companies of different sectors. The index of BSE is Sensex 30, which consist 30 leading scrips of all the sectors.

In NSE, right now there are 11 sectors as Nifty Bank, Nifty Auto, Nifty Fin Services, Nifty FMCG, Nifty IT, Nifty Metal, Nifty Media, Nifty Pharma, Nifty PSU Banks, Nifty Private Banks, and Nifty Realty. These sectoral indices consist of key companies of that field with large market capitalization. In this paper we have considered only Bank nifty index. Bank nifty index is the combination of 12 banks with 3 public sector banks and 9 private sector banks.

Indian banking industry is the backbone of the country's economy. Banking industry has significant role in industrial growth as well as country's economic growth. Mostly public and private sector banks are listed on NSE, BSE and MSE. Investors invest their hard-earned money in these stocks, hoping to get higher return with minimum risk. The risk and return are the two faces of the Investment coin. Earlier this sector was known as a reliable sector for all the traders and investors. Presently, banking sector is facing problem of high NPA, which is higher in public sector banks comparatively. A lot of frauds and frauds have been disclosed in banks, resulting reduction in its profits. Share prices of these shares are also fluctuating at a very high rate. So, this sector is losing reliability among its investors. People are getting a low return from investing in this sector, and sometimes even they are losing their principal amount. Investment in the stocks of banking sector has been risky.

At present, in bank nifty, following banks are included, RBL Bank, ICICI Bank, Yes bank, Axis bank, Federal bank, PNB, SBIN, Kotak bank, IndusInd Bank, HDFC Bank, Bank of Baroda and IDFC First Bank. The changes in share price of these public and private banks also fluctuate to bank nifty. In this paper, we have checked the long run and short run relationship among the

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variables. we have not included IDFC First Bank in our research, because after including it, there was a problem in finding optimum lag length.

Literature Review:

Equity market of Pakistan cointegration with China, India, Taiwan, Singapore, Janpan, UK, Indonesia and USA were analysed using the monthly data of the market indices. The result indicated that the Pakistan equity market has no significant association with USA, Taiwan, UK, Singapore and Malaysia(Butt & Ur Rehman, 2011).Whereas the equity market of Pakistan showed a significant association with equity market of countries like Indonesia, Japan , India and china. Hence it was inferred that the international portfolio diversification for risk minimization is minimum in equity markets of countries with significant association.

The interrelation between developed countries stock market investigation was conducted by using data from Germany, Britain, Turkey, France and USA. The vector auto regression for dynamic conditional correlations under multivariate generalized auto regressive conditional heteroskedasticity analysis revealed that the agreement of custom union varied in the pre and post agreement periods(Ta¸stan, 2005).

The short-run and long-run dynamics among the major sectoral stock records of the Istanbul Stock Exchange was examined using techniques suggested by Engle and Granger (1987),Cointegration tests, Johansen and Juselius (1990) and causality by Vector Error Correction Model (VECM). Change deterioration was examined to segment the fluctuation of the conjecture blunder of one area file into extents owing which discovered that all areas showed consistent and solid proof short run and long run relationship. In total, 63 percent in the gap between chemical, petroleum and plastic, 57 percent of returns from basic metals and 79 percent of the returns from the Financing and Investment institutions inferred that the banking sector in the most promising for investment in ISE(Vardar et al., n.d.).

Adding to the pitiful distributed writing on interrelationships among securities exchange areas of an economy, the current investigation inspected both the long-run and short-run aspects between sectoral linkages in the Egyptian securities exchange. The multivariate Cointegration examination reported proof on the side of presence of just a solitary Cointegration vector inside the sectoral lists. In addition, the consequences of Granger's causality examination showed that

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the short-run causal connections between the sectoral records are extensively restricted and, where they exist, basically unidirectional. These outcomes conclude that there was space to get profits by portfolio expansion in the short run. In any case, financial specialists with long run may not profit by broadening interests into the various areas of the Egyptian securities exchange (Ahmed, 2011).

The association between Indian stock exchange BSE major index, Sensex, and five macro-economic variable indicators viz., Index of industrial production, index of wholesale price, supply of money, short term government securities (T-Bill) interest rate and foreign exchange rates were examined using Johansen's co-coordination and vector error correction model. The investigation uncovered that macroeconomic factors and the Sensex had long term association. The conversion standard and the momentary financing cost were discovered to be inconsequential in deciding stock costs. The macro economic factors Granger causes stock price in long term period but not in short term period. Between the production index and stock index, there was a two directional causality, whereas supply of money to stock index, stock index to production index, T-bill interest rates and foreign exchange rates showed one directional granger causality(Pramod Kumar & Puja, 2012).

The current examination investigated the dynamic impacts of Exchange rates on BSE Sensex return utilized factual strategies, ADF Test, Correlation, OLS Regression, Cointegration Test, Granger Causality Test, VAR model and GARCH. The examination result found that trade rates were negatively corresponded on BSE Sensex return. The outcomes showed the presence of co-development connection between trade rates and BSE Sensex return. VAR results showed that there was short run impact and GARCH results uncovered that trade rates were altogether unpredictable on BSE Sensex return. The outcomes inferred that trade rates had a critical effect on BSE Sensex return and there was presence of since quite a while ago run connection between trade rates and BSE Sensex return. The investigation results recommended to speculator's locale should mindful about the developments of trade rates; especially in USD/INRs on the grounds that it has profoundly communication with Indian securities exchange and it might diminish the danger from the high variance of trade rates (Baranidharan, n.d.).

The investigation of long-term and short-term relationship among USD/INR, gold costs and unrefined petroleum costs proposed that there is no long run relationship between the factors.

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The long run relationship was examined utilizing Johansen Cointegration test. The investigation additionally analysed the short-run relationship utilizing test of Granger causality and VAR. The outcomes uncovered there was two-directional Granger causality between raw petroleum and USD/INR conversion standard, though unidirectional Granger causality was found between raw petroleum to gold price(Lodha, 2017).

The level of vulnerability in financial exchange is high on account of agriculturally based Indian and similar economies. Investigation of causal relationship of gold, unrefined petroleum, and USD rates with securities exchange records in India was analysed with the assistance of econometric instruments viz. Unit root test by Enlarged Dickey-Fuller, Johansen Cointegration Test, Granger Causality Tests, VAR Model, test of Variance Decomposition, and Impulse reactions investigation. The outcome showed that there is a high imprint in Indian financial exchange because of the instability occurring in the portrayed macroeconomic elements (Suresh Gopal, n.d.).

The relationship between the rate of returns of securities exchange in Nigeria and world unrefined petroleum cost investigated under the Cointegration and vector blunder amendment (VECM) system showed that rate of return of securities exchange in Nigeria and crude oil cost were integrated in long term period as foreseen given the strength of crude oil sector in Nigeria. It was also discovered that it might be a sign of the nation's inability to interpret its enormous unfamiliar trade income from oil into an improved modern area efficiency. It was suggested that the most practical arrangement towards improved monetary execution lied in refining the Nigerian raw petroleum locally so the enormous advantages of the normally invested oil can be acknowledged rather for the advancement of the economies of different countries (Asaolu&Ilo, 2012).

The present and long run relationship among BSE 500, BSE 200 and BSE 100 Indices of BSE and petroleum prices utilizing different econometric strategies was examined to cover the there was a co-incorporated long-term connection between three lists and rough cost. Granger causality results uncover that there was one way causality relationship from all list of the financial exchange to unrefined cost, however rough cost was not the causal of every one of the three lists(Bhunia, 2012).

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Crude oil price and BSE Sensex from 2007 to 2015 was investigated to discover the short term and long-term relationship. Utilizing Johansen's Cointegration test, examination found the presence of a long run association among crude oil price and Sensex. Blunder remedy results demonstrated that crude oil price affects the developments in Sensex and stuns that happen to crude oil prices had negative effects on the developments of BSE Sensex. Granger Causality test was used for examining the presence of transient relationships. It is discovered that the one directional causality between petroleum costs to Sensex(Mahadevan&Sriram, 2015).

Objectives of the Study:

(1) To study the selected variable causality between the Nifty bank index and selected 11 banks share prices of public and private sector.
(2) To inspect long term cointegration between Nifty bank Index and 11 Indian banks share prices.

Hypothesis of the Study

Ho1: There is no normality in variables.

Ha1: Normality exists in variables.

Ho2: Unit Root does not exist among the variables

Ha2: Unit Root exists among the variables.

Ho3: There is no Cointegration exists among the variables

Ha3: There is Cointegration exists among the variables

Ho4: Variables have no short-term relationship.

Ha4: Variables have short term relationship.

Research methodology:

The study is conducted over the period of 2 years from 02-01-2017 to 31-12-2019. The total data collected after removing the holidays, the 730 days' data is used for analysis. The data of indices

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and stock prices are collected from the public domain of National Stock Exchange from url link https://www.nseindia.com.

11 banking stocks listed on NSE India were selected to study against the Nifty Bank index which were RBL Bank, ICICI Bank, Yes bank, Axis bank, Federal bank, PNB, SBIN, Kotak bank, IndusInd Bank, HDFC Bank, Bank of Baroda and IDFC First Bank.

Statistical tools applied for the present study were Descriptive statistics, Unit Root Test, VAR, Johansen's Cointegration test and impulse diagnostic. E-views was selected as research software for data analysis.

Statistical Tools of Analysis

Stationary test using Augmented Dickey Fuller (ADF): The common problem in time series is of not being of stationarity. Stationary of the time series can be presented by following equation:

$$Yt = \rho Yt-1 + ut \text{----------} (a)$$

$$Or$$

$$Yt = \delta Y\, t-1 + ut \text{----------} (b)$$

In the equation (a), the value of ρ equal to 1 represent that the time series data has unit root and is non stationary and vice versa. Similarly, in equation (b), the value of δ equal to 0 represent that the time series data has unit root and is non stationary and vice versa. The δ is also known as Tau statistic and tested using Monte Carlo simulations, also known as Dickey Fuller (DF) test (Dickey Fuller, 1979, 1981). So as per DF test, if the hypothesis of δ equal to 0, time series is stationary and vice versa. The time series is assumed to be with uncorrelated error term, *ut.*In the case of uncorrelated error term, Dickey and Fuller developed another test, known as Augmented Dickey Fuller (ADF) test.

Vector Auto Regression

VAR model is an advanced model of AR model when the model has more than one variable. A VAR model has more than one dependent variable and thus has more than two Autoregression Distributed Lag equations of all the variables.

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$$Yt = \alpha 1 + \delta 1t + \varphi 11Yt-1 + \ldots + \varphi 1pYt-p + \beta 11Xt-1 + \ldots + \beta 1qXt-q + €1t \quad \text{---------- (c)}$$

$$Xt = \alpha 1 + \delta 2t + \varphi 21Yt-1 + \ldots + \varphi 2pYt-p + \beta 21Xt-1 + \ldots + \beta 2qXt-q + €2t \quad \text{---------- (d)}$$

Both the equations (C) and (d) are to test Granger causality of X on Y and Y on X respectively. Combination of both equations are VAR model. The VAR(p) model for a d-dimensional vector Yt is given by:

$$Yt = \alpha + \delta t + \Theta 1Yt-1 + \ldots + \Theta pYt-p + €t$$

whereΘj is a d × d matrix and €t is a d-dimensional vector of white noise terms with a covariance matrix.

The VAR model can be used to estimate the lag length p with the help of AIC or SIC. Once the lag length is estimated the coefficients is used to forecast the dependent variable.

Cointegration

To discover long-run relationships between the selected variables, Johansen and Juselius's (1990) cointegration technique has been used. When in multivariate time series analysis, some of the variables are stationary and others are non-stationary, the variables need to be differentiated to obtain stationary. When two or more than two-unit root time series exist in a combination of linear equations, the series are called cointegrated (Engle and Granger, 1987). Thus, it can lead to the inference of long-term relationship between the variables. The Johansen cointegrationtest is used to check the presence of long run relation among the study variables if the variables are integrated in the first order difference. Trace Value Test & Maximum Eigen value tests are applied to determine the cointegration rank.

$$\lambda_{trace}(r) = - N\sum^{n}_{i=r+1} \ln(1-\lambda)$$

$$\lambda_{max}(r) = - N log(1-\lambda_{r+1})$$

where, λ_i is largest Eigen value

λ_{max} is the $(r+1)^{th}$ is the largest squared Eigen value

N is number of observations

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Granger Causality Test

Data are basically in the form of cross-sectional or time series. In cross sectional, the regression analysis dealing might result in relationship but will not prove to have causality or influencing direction. But in time series the variables influence need to be checked. The same is checked by F test on the two linear equations for bilateral causality:

$$F = \frac{(\mathrm{RSS}R - \mathrm{RSSUR})/m}{\mathrm{RSSUR}/(n-k)}$$

Analysis and Results:

(1) Stationary test by Unit Root Analysis:

Stationary is one of the major assumptions for a time series data to conduct any econometric analysis. Any data which is non stationary can result a false result which is known commonly as spurious regression. Although, there is method of converting the non-stationary data into stationary. The data of time "t" can be deducted with its own previous data "t-1", known as differencing. We calculated unit root at raw data i (0), applying Augmented Dickey – Fuller test. In below mentioned result probability value of all the variables is higher than 0.05 and t-stat value is lesser than all the critical values at 1%, 5%, and 10% level which indicates data is non-stationary.

Table. 1(a)

Augmented Dickey-Fuller test			
S.No	**Bank**	**t-Statistic**	**Prob.***
1	BANKNIFFTY	-1.908492	0.3285
2	HDFCBANK	-1.871382	0.3460
3	AXISBANK	-1.404707	0.5811
4	FEDERALBANK	-2.574305	0.0988
5	ICICIBANK	0.068603	0.9632
6	INDUSIND	-2.771625	0.0629
7	KOTAKBANK	-0.909248	0.7854
8	BANKOFBARODA	-1.674702	0.4438
9	PNB	-1.243286	0.6572
10	RBL	-1.803257	0.3791
11	SBIN	-2.93138	0.0423
12	YES	-0.050879	0.9525
	1% level	-3.438984	
	5% level	-2.86524	
	10% level	-2.568796	

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After finding that variables are non-stationary, we tried to convert it into stationary, for further process. Using the following formula, we found the daily return.

$$R_t = \frac{Ct - Ct-1}{Ct-1} X\ 100$$

Where R_t = Return of today

C_t = Today's closing Price

C_{t-1} = Yesterday's closing Price

It was converted into first difference using the following formula in eviews:

Bankniftyreturn=Dlog (bank nifty)X100

In table no. 1(b) we can see that the probability value of all the banks is less than 0.005 and t value is higher than its critical value at 1% and 5%. We used log differences to check the stationarity.

Table. 1(b)

Augmented Dickey-Fuller test			
S.No	**Bank**	**t-Statistic**	**Prob.***
1	BANKNIFFTY	-25.81846	0.000
2	HDFCBANK	-29.3744	0.000
3	AXISBANK	-27.41599	0.000
4	FEDERALBANK	-27.25861	0.000
5	ICICIBANK	-28.51818	0.000
6	INDUSIND	-25.63898	0.000
7	KOTAKBANK	-29.55805	0.000
8	BANKOFBARODA	-27.01393	0.000
9	PNB	-25.35343	0.000
10	RBL	-23.97488	0.000
11	SBIN	-26.88183	0.000
12	YES	-27.32824	0.000
	1% level	-3.438984	
	5% level	-2.86524	

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(2) Descriptive statistics:

In table no. 2, Kurtosis values of ICICI bank and RBL bank are more than 3, justifying leptokurtic, while kurtosis values of remaining variables are less than 3, which indicate platykurtic in nature. Jarque-Bera statistic measures the difference of skewness and kurtosis of the series with those from the normal distribution. Here probability value of Jarque –Bera, in case of bank nifty is less than 0.05 indicating normal distribution of series, while remaining variables' probability value is less than 0.05 which shows distribution is not normal of these series.

	BANK NIFTY	BANKO F BAROD A	AXIS	FEDER AL BANK	HDFC BANK	ICICI	INDUS IND	KOTAK BANK	PNB	RBL	SBIN	YES
Mean	26165.32	135.51	599.45	94.60	1866.87	341.86	1589.61	1194.02	106.93	512.24	289.94	248.67
Median	26154.75	136.70	559.40	91.45	1912.75	318.35	1576.60	1183.35	88.35	523.15	286.80	289.80
Maximum	32412.35	195.75	822.80	126.45	2495.00	549.40	2023.05	1729.50	213.60	701.45	372.40	394.00
Minimum	17891.00	87.25	445.00	65.75	1101.05	251.10	1087.45	695.60	56.45	251.70	233.20	32.00
Std. Dev.	3057.19	27.47	99.76	13.22	345.25	66.28	196.51	242.49	40.23	94.10	28.76	103.19
Skewness	-0.20	0.11	0.55	0.35	-0.44	1.09	0.21	0.18	0.61	-0.61	0.55	-0.70
Kurtosis	2.87	1.87	1.95	2.12	2.29	3.60	2.45	2.22	1.98	3.11	2.83	2.18
Jarque-Bera	5.28	41.00	71.47	38.96	39.55	156.44	14.63	22.80	77.62	45.97	37.62	81.66
Probability	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Observations	739	739	739	739	739	739	739	739	739	739	739	739

(3) VAR

It was conducted to find out optimum leg length and best fitted model to run Johansen Cointegration test. In table no.3, we can see so many criteria as Akaike Information Criteria (AIC), Schwarz Information Criteria (SIC) or Hannan-Quinn Information Criteria (HQC), for lag selection. But generally, we consider SIC or AIC for lag selection. In the below mentioned table, we can see that SC has the least value at 0 lag. But SC has the least value at 0 lag, so we are considering AIC for our research. We used the following process to find this VAR: select the return series—open as VAR---- go to view-----Lag structure---- Lag length criteria

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VAR Lag Order Selection Criteria
Endogenous variables: RETBANKNIFTY RETBANKBARODA RETAXIS RETFEDERAL RETHDFC RETICICI RETINDUS RETKOTAK RETPNB RETRBL RETSBIN RETYES
Exogenous variables: C

Sample: 1/02/2017 12/31/2019
Included observations: 720

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-16778.85	NA	154476.4	46.00232	46.07782*	46.03145*
1	-16632.06	288.3559	153306.2*	45.99467*	46.97620	46.37335
2	-16538.11	181.4571	175888.1	46.13181	48.01936	46.86004
3	-16461.99	144.5312	211988.4	46.31777	49.11135	47.39555
4	-16363.37	183.9963	240386.9	46.44210	50.14171	47.86944
5	-16279.46	153.7862	284051.8	46.60675	51.21238	48.38363
6	-16195.26	151.5681	335741.3	46.77057	52.28223	48.89701
7	-16103.37	162.3832	389081.7	46.91334	53.33102	49.38932
8	-15984.72	205.7661*	419675.6	46.98279	54.30650	49.80833

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion

(1) **Johansen Cointegration test**

It is conducted to examine whether Cointegration as well as long run relationships exist or not, among the variables. To conduct such a test, we need raw data of all the variables. As per below mentioned results in table no 4(A) of trace test, all the probabilities values are higher than 0.05, it is inferred that the Trace test statistic values denotes the acceptance of null hypothesis at 0.05 level, indicating no long run Cointegration exists among the variables. But if we see table no 4(b). the results of maximum Eigenvalue showing probability value 0.0015 at none which is lesser than 0.05, indicating there exists one Cointegration equation.

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Table. 4(A)

Trend assumption: Linear deterministic trend

Series: BANKNIFTY, AXIS, BANKOFBARODA, FEDERALBANK, HDFCBANK, ICICI, INDUS_IND, KOTAK_BANK, PNB, RBL, SBIN, YES

Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.116241	307.0645	334.9837	0.3414
At most 1	0.059788	215.9927	285.1425	0.9730
At most 2	0.047320	170.5565	239.2354	0.9895
At most 3	0.045217	134.8295	197.3709	0.9909
At most 4	0.035138	100.7279	159.5297	0.9958
At most 5	0.028571	74.36564	125.6154	0.9957
At most 6	0.022789	53.00253	95.75366	0.9935
At most 7	0.020450	36.01235	69.81889	0.9863
At most 8	0.012660	20.78432	47.85613	0.9862
At most 9	0.007497	11.39471	29.79707	0.9509
At most 10	0.005765	5.848906	15.49471	0.7133
At most 11	0.002152	1.587527	3.841465	0.2077

Table 4(b)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.116241	91.07175	76.57843	0.0015
At most 1	0.059788	45.43627	70.53513	0.9606
At most 2	0.047320	35.72693	64.50472	0.9966
At most 3	0.045217	34.10162	58.43354	0.9769
At most 4	0.035138	26.36226	52.36261	0.9961
At most 5	0.028571	21.36311	46.23142	0.9971
At most 6	0.022789	16.99018	40.07757	0.9968
At most 7	0.020450	15.22803	33.87687	0.9717
At most 8	0.012660	9.389612	27.58434	0.9918
At most 9	0.007497	5.545800	21.13162	0.9903
At most 10	0.005765	4.261379	14.26460	0.8308

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At most 11	0.002152	1.587527	3.841465	0.2077

Max-eigenvalue test indicates 1 Cointegrationeqn(s) at the 0.05 level

To justify the result of cointegrated equation, indicated by max Eigenvalue test in table no. 5b, we checked the long-term relationship of bank nifty with other banks on an individual level. We can see this result in below mentioned table 4(c)

Table 4(c)

Bank Nifty and Axis Bank
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.012206	9.465108	15.49471	0.3241
At most 1	0.002123	1.396146	3.841466	0.2374

Bank Nifty and Axis Bank
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.012206	8.068961	14.26460	0.3717
At most 1	0.002123	1.396146	3.841466	0.2374

Bank Nifty and Bank of Baroda
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.016188	11.76459	15.49471	0.1686
At most 1	0.001585	1.041990	3.841466	0.3074

Bank Nifty and Bank of Baroda
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.016188	10.72260	14.26460	0.1687
At most 1	0.001585	1.041990	3.841466	0.3074

Bank Nifty and HDFC Bank
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.008881	5.880121	15.49471	0.7096
At most 1	2.90E-05	0.019026	3.841466	0.8902

Bank Nifty and HDFC Bank
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.008881	5.861094	14.26460	0.6311
At most 1	2.90E-05	0.019026	3.841466	0.8902

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2022.28.03.070

Bank Nifty and Federal Bank

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.015256	10.72619	15.49471	0.2289
At most 1	0.000952	0.625799	3.841466	0.4289

Bank Nifty and Federal Bank

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.015256	10.10039	14.26460	0.2054
At most 1	0.000952	0.625799	3.841466	0.4289

Bank Nifty and ICICI

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.012330	8.288045	15.49471	0.4351
At most 1	0.000208	0.136640	3.841466	0.7116

Bank Nifty and ICICI

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.012330	8.151405	14.26460	0.3635
At most 1	0.000208	0.136640	3.841466	0.7116

Bank Nifty and Indusind Bank

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.013862	9.254267	15.49471	0.3424
At most 1	0.000127	0.083316	3.841466	0.7728

Bank Nifty and Indusind Bank

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.013862	9.170951	14.26460	0.2722
At most 1	0.000127	0.083316	3.841466	0.7728

Bank Nifty and Kotak Bank

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.013161	9.038093	15.49471	0.3619
At most 1	0.000508	0.333842	3.841466	0.5634

Bank Nifty and Kotak Bank

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.013161	8.704252	14.26460	0.3116
At most 1	0.000508	0.333842	3.841466	0.5634

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2022.28.03.070

Bank Nifty and PNB Bank
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.012260	8.875689	15.49471	0.3770
At most 1	0.001173	0.771194	3.841466	0.3798

Bank Nifty and PNB Bank
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.012260	8.104495	14.26460	0.3682
At most 1	0.001173	0.771194	3.841466	0.3798

Bank Nifty and RBL bank
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.008187	5.402673	15.49471	0.7647
At most 1	2.65E-06	0.001743	3.841466	0.9641

Bank Nifty and RBL bank
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.008187	5.400930	14.26460	0.6906
At most 1	2.65E-06	0.001743	3.841466	0.9641

Bank Nifty and SBIN
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.013685	12.23393	15.49471	0.1461
At most 1	0.004830	3.180871	3.841466	0.0745

Bank Nifty and SBIN
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.013685	9.053064	14.26460	0.2817
At most 1	0.004830	3.180871	3.841466	0.0745

Bank Nifty and Yes Bank
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.012715	8.483482	15.49471	0.4152
At most 1	0.000116	0.075989	3.841466	0.7828

Bank Nifty and Yes Bank
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.012715	8.407492	14.26460	0.3388
At most 1	0.000116	0.075989	3.841466	0.7828

In the above-mentioned table, we can see all the p values are higher than 0.05 in both the tests whether it is trace test or max eigenvalue test. But, if we focus on bank nifty and SBIN, we can

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2022.28.03.070

see P value is around 0.07 in max Eigenvalue test, indicating a weaker long-term relationship between these two variables. If we talk about 10 %, it has a long-term relationship but at 5%, it is indicating a weaker relationship.

5. Granger Causality / Block Exogeneity Wald Tests:

Granger Causality is used to check the cause-and-effect relationship i.e., whether dependent variables affect independent variables or vice versa. In the Johansen Cointegration test we found that no long-term relationship exists among the variables, so we are checking the short term relationship of independent variables with dependent variables (Bank Nifty Index). Here as per the result, in the short run HDFC bank, ICICI bank, and Kotak bank have probability value lesser than 5%, so our null hypothesis is accepted and these banks are in leading position, indicating short term impact of these banks over bank nifty.

Sample: 1/02/2017 12/31/2019
Included observations: 736
Dependent variable: RETBANKNIFTY

Excluded	Chi-sq	df	Prob.
RETBANKBARODA	2.267884	2	0.3218
RETAXIS	0.555591	2	0.7575
RETFEDERAL	0.621702	2	0.7328
RETHDFC	86.76571	2	0.0000
RETICICI	12.09115	2	0.0024
RETINDUS	1.267148	2	0.5307
RETKOTAK	7.583524	2	0.0226
RETPNB	0.068542	2	0.9663
RETRBL	0.542859	2	0.7623
RETSBIN	2.200346	2	0.3328
RETYES	0.241314	2	0.8863
All	116.5196	22	0.0000

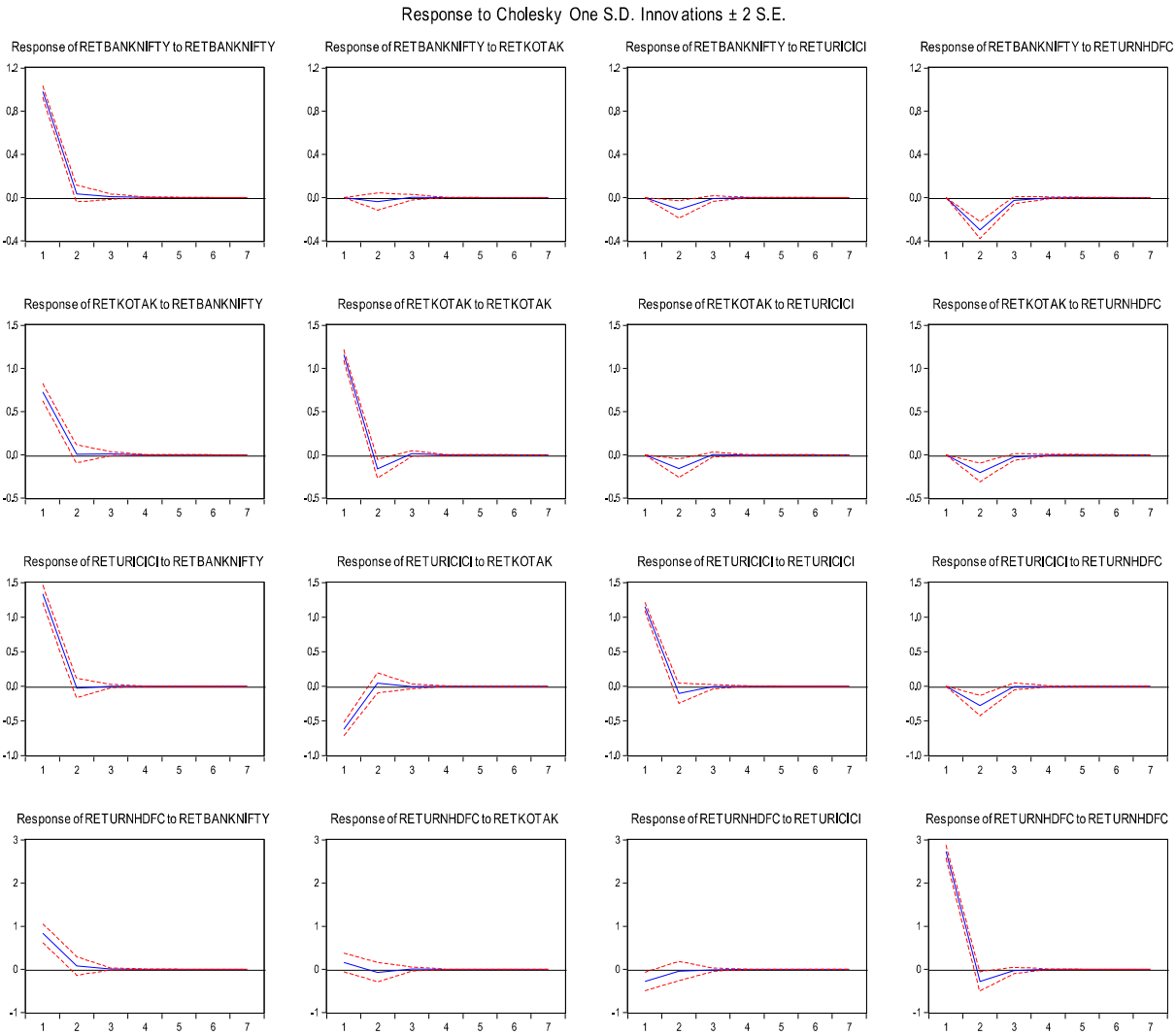
Normalized equation is estimated as below:

RETBANKNIFTY = 0.474359074431*RETBANKNIFTY(-1) 0.116390603642*RETKOTAK(-1- 0.117454032363*RETURICICI(-1) - 0.115246298528*RETURNHDFC(-1)+ 0.0504359411025

P-ISSN: 2204-1990; E-ISSN: 1323-6903
DOI: 10.47750/cibg.2022.28.03.070

6. Impulse Diagnostic:

It was used to check the impact of one standard deviation shock on another variable. In above mentioned table no. 4(A), 4(b) and 4(C), there exists no long-term relationship among the variables. But Table No.5 indicates short term relationship among RETBANK Nifty, RETHDFC, RETICICI and RETKOTAK bank. So, we considered only these four variables in impulse diagnostic. Seven days' period has been taken to check the impulse response. In response of Ret Kotak to Ret bank nifty, we can see a one SD shock to RET KOTAK has noticeable impact on ret bank nifty on first and second day, it is going down sharply for first two days, after that it has minor impact, same thing we can see in case of ret ICICI to Ret Bank Nifty and Ret HDFC to Ret Bank Nifty.



P-ISSN: 2204-1990; E-ISSN: 1323-6903
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Conclusion

Augmented Dickey Fuller test was used to check the stationarity of variables; results showed that all series were non-stationary at level (0) but when these were converted into first difference these became stationary. As per the Jarque –Bera in descriptive analysis, only bank nifty has normality distribution, while other banks have p value more than 0.05, indicating there is no normality in other variables series. VAR was used to find the optimum lag. SC has least value at 0 lag, so we considered AIC which has least value at 1st lag to carry out our research. We conducted a Johansen Cointegration test to check if a long-term relationship exists or not among the variables. The result of the Trace test accepted the null hypothesis because all p values were higher than 0.05, on the other side max Eigen test was rejecting the null hypothesis because of having p value 0.0015 lesser than 0.05. So, we checked the relationship of all the variables with bank nifty individually and found that only SBI had a long-term relationship with bank nifty. But this relationship was weaker at 5%, so we did not use VECM. The short run causality was examined by applying Granger test and they are in the leading position in the short term. HDFC bank, ICICIbank, and Kotak bank movements can notably influence the bank nifty in a short span of time.

Managerial Implication

The study in the current time holds good as the stock market, especially the banking sector, has seen high volatility in the share prices of the banks both in the public sector as well as the private sector. The bank index is referred to quickly get the essence of the whole banking shares. Hence the study on the relationship between the bank nifty index with public and private sector bank share prices is carried on. The results explain the relationship in respect to causality and cointegration for short run and long run respectively.

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