

An Empirical Relationship Between Macroeconomic Variables And Selected NSE Sectoral Indices

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Abstract- *The study empirically scrutinize and gives an understanding of the long run and short run association between Macroeconomic aggregates and selected NSE Sectoral Indices Series. The monthly time series data for the time span from April 2005 to March 2017 was analyzed through the application of various econometric techniques such as Cointegration Approach, VAR Model and Innovation Accounting techniques such as Forecast error Variance Decomposition. The results revealed no cointegrating long run association amongst the variables. The Granger Causality test signifies that no causality running either way amongst the selected Macroeconomic variables and the closing prices of Nifty Auto, Nifty Bank, Nifty Pharma and Nifty PSU bank but there is cause and effect relationship amongst the rest of the variables. The results of the Variance Decomposition revealed that variances in the stock prices were mainly attributed by its own variations. Such an investigation will serve as a useful tool for Individual Investors, Institutional Investors, Foreign Investors, Portfolio Managers, Mutual Funds as well as Policy Makers in designing a significant economic policy and Investment strategies.*

Keywords- Macroeconomic variables, Sectoral Indices, Cointegration, Causality, VAR Model

I. INTRODUCTION

There exist parallelism in the growth prospects of both the stock market and economy. Any Macroeconomic announcements significantly influences the economic activities and thereby the stock prices. The stock prices reflect the sentiments and expectation of market players on account of various Macroeconomic aggregates. Such a dynamic relationship has dominated many researchers and academicians in both emerging and developed economies. There are few studies which reflect the sectoral approach of Investment opportunity. Quite often, each sector doesn't not behave identically to fluctuations in macroeconomic aggregates. The information flow across sectors, responses towards shocks and innovations in each sector will provide diverse implications under different economic scenario.

Macroeconomic variables such as crude oil prices may provide a favorable or unfavorable impact depending upon whether the economy being studied is an oil based economy or not i.e. whether the country is oil exporting country or oil importing country. A declining exchange rate increases the production cost of companies, reduces the cash flows from equity investments and thereby will affect the stock prices negatively. This scenario is beneficial for export oriented firms in export sector whereas import oriented firms will suffer by having a relative competitiveness of domestic goods in the international market. Some sectors like pharmacy, IT etc are more influenced by factors like exchange rate fluctuations, global competition, and margin requirements and so on. The Banking sector is likely to gain whereas other sectors will suffer during higher interest rate scenario leading to growth in profitability and favorable impact on stock prices of Banking Companies. The understanding of such behavior of economic factors and sectors will serve as a benchmark to construct a well diversified portfolio.

II. REVIEW OF LITERATURE

There exist distinct outcomes with supporting evidences to identify the influence of a single or independent macroeconomic variable on the stock market. Even comprehensive research has been carried out to examine the dynamic relationship between Macroeconomic variables and general stock market index. The present study moves ahead with the fact that that the web of different economic factors have different implications on each sector of the economy.

(Maysami & Koh, 2000), employed monthly time series data for a time span of seven years from January 1988 to January 1995, to examine the dynamic relationship among the selected macroeconomic variables, Singapore stock index, Singapore Stock indices and stock indices of its two major business partners of Singapore namely Japan and United states. The present study applies Johansen Cointegration test and Vector Error Correction Model to analyze the long run equilibrium relationship among the variables. The results exhibit a high and significant cointegrating relationship among the Singapore, Japan and United states stock markets. The

findings also detected sensitivity of Singapore stock market towards the fluctuations in external macroeconomic factors.

(Sohail & Hussain, 2009), examined the long-run and short-run relationships between Lahore Stock Exchange and Macroeconomic Variables in Pakistan. The monthly data from December 2002 to June 2008 was used in this study. The results revealed that there was a negative impact of Consumer Price Index on stock returns while Industrial Production Index, Real Effective Exchange rate and Money supply had a significant positive effect on the stock returns in the long-run. They used Johansen-Juselius (1990) multivariate Cointegration and VECM model technique. The results of Variance Decompositions revealed that out of five Macroeconomic variables Consumer Price index showed greater forecast error for LSE25 Index.

(Hancocks, 2010), This study analyzed the influence of selected Macroeconomic variables on stock market prices of All -share, Financial, Mining and Retail Indices of Johannesburg Stock Exchange in South Africa. To show Cointegrating relationship, Johansen Cointegration test is applied. Other tests like VECM, Variance Decomposition and Impulse Response test were used to indicate short and long run effect. The study concludes that macroeconomic variables are important determinants affecting stock prices and each sector needs to be examined separately to capture its effects.

(Singh, 2014), explored the interaction between macroeconomic variables and Indian stock market Indices from January 2011 to December 2012. The estimation of dynamic relationship is realized through Correlation, Mutivariate regression and Granger causality analyses which evidence an adverse impact of gold prices and exchange rate on the stock market. Their findings suggest a strong causality flowing from FII to stock market. Apart from this there is no unidirectional as well as bidirectional causality flowing among any of the other variables.

(Kalyanaraman, 2015), The study examined the nexus between the select macroeconomic variables, CPI, industrial production, money supply, exchange rate, oil prices and global stock prices on the returns of the 15 sectors listed on Saudi stock market. The statistical technique used for the analyses are Cointegration, Causality, Unit Root, Vector Error correction model and Wald test to check the long-run and short-run causality relationship between the macroeconomic variables and sectoral stock indices. Vector error correlation model shows the presence of long run causality from the explanatory variables to the stock prices. Short run causality test found a two way causality between stock prices and oil prices ,they also found that the industrial production shocks pushes up the stock prices while consumer price index shocks

pulls the stock price down. This study provides an important tool facilitating decision making with respect to investment among the specific sectors.

(Jha & Singh, 2014), This study is conducted to investigate the variations in the stock prices with respect to macrofactors. Various techniques like Cointegration, Innovation accounting was applied to know the short term dynamic and long run relationship among the variables. Innovation accounting techniques like Variance decomposition and Impulse Model concluded that how the stock market responds to shocks or innovations in macroeconomic variables. It was observed that BSE sensx shows a positive response with respect to one standard innovation in FII indicating a positive long run association and variations in stock prices were mainly attributed to its own variations. In order to predict the volatility ARCH (Autoregressive Conditional Heteroskedasticity) model was being used. One important fact revealed by the study was the emergence of EGARCH method as the best tool to meet forecasting requirement.

The existing literature review attempts to fill the gap in the least researched area, so as to develop a better insight of dynamic interlinkages between macroeconomic variables and their significant effect on each of the sector indices. The key area of the study is to examine the short run and long run influence of macroeconomic factors on sector indices to understand their interplay towards the changes in economy and its policy implications.

The study is organized into five sections. First section deals with Introduction to the study followed by Empirical review of literature in section two. Section Three elaborates objectives and research methodology of the study while section four reveals empirical results. Finally Section five is dedicated to key conclusive findings of the study.

III. OBJECTIVES AND METHODOLOGY

OBJECTIVES

- 1) To determine the existence of cointegrating long run relationship between the selected macroeconomic indicators and returns on sector indices.
- 2) To determine the Short run equilibrium relationship between the selected macroeconomic indicators and returns on sector indices.
- 3) To know the variations in selected sector indices towards the shocks and Innovations in Macroeconomic factors.
- 4) To analyze the cause and effect relationship between the macroeconomic indicators and returns on sectoral indices.

HYPOTHESIS

The Null hypotheses formulated to study the significant relationship among the variables are:

H0: The series under consideration are non stationary.

H0: There is no long run and short run equilibrium relationship between macroeconomic variables and each of the sector Indices.

H0: There is no Causality relationship among macroeconomic variables and each of the sector Indices.

Reject H_0 if $p < 0.05$.

The present study restricts its scope to Indian sectoral indices with reference to National Stock Exchanges. An empirical analyses on the secondary data of selected sectoral indices (NIFTY Auto Index, NIFTY Bank Index, NIFTY Financial Services Index, NIFTY FMCG Index, NIFTY IT index, NIFTY Metal Index, NIFTY Pharma Index, NIFTY Private Bank Index and NIFTY PSU Bank Index) and selected Macroeconomic variables such as Crude oil prices, Foreign Exchange rate, Foreign Exchange Reserves, Bank Interest Rate and Wholesale Price index (WPI) were analyzed for period of 12 years ranging from 1st April 2005 to 31st March 2017. The monthly time series data on NSE Sectoral indices and macroeconomic variables were obtained from Official Website of National Stock Exchange of India (www.nseindia.com), Reserve Bank of India (www.rbi.org.in) and Multi Commodity Exchange of India (www.mcxindia.com). To test the hypothesis under study all the variables were converted into log series, calculated as $R_t = \ln(I_t / I_{t-1})$ Where \ln stands for natural logarithm, I_t is Index values at time t and $t-1$. The data must obey the time series properties as a result unit root test has been employed to ensure the stationary of data. The study also employs the Johansen Multivariate Cointegration Test to determine whether selected macroeconomic variables are cointegrated with stock prices. Furthermore Error Variance Decomposition analyses are used to examine the dynamic relations between Stock Indices and various Macroeconomic Variables. Lastly Granger causality test has been employed to indicate cause and effect relationship.

IV. EMPIRICAL ANALYSIS

For the purpose of Analyzing and Interpreting the data, the following statistical tools and techniques are used.

1. DESCRIPTIVE STATISTICS TECHNIQUE

The basic statistical values of the variables are calculated in the first phase of our study. The descriptive

statistics provide a historical background for behavior of the data. Its characteristics can be shown either in quantitative or visual format (i.e. either statistic or graphs).

Table 1: Summary of Descriptive Statistics

Particular	Mean	Maximum	Minimum	Standard deviation	Skewness	Kurtosis	Jarque-Bera
Descriptive Statistics of Sectoral Indices							
Nifty Auto	4231.78	10164.92	1030.868	2646.305	0.790971	2.319736	17.792 (0.00014)
Nifty Bank	10453.19	19869.64	3389.294	4832.221	0.448386	2.157382	9.0852 (0.0107)
Nifty FMCG	11394.12	22425.47	2865.172	6327.443	0.38456	1.570091	15.817 (0.0004)
Nifty Metal	3387.242	40222.2	981.6352	4300.711	6.190261	43.91897	11971.9 (0.0000)
Nifty IT	6702.694	12379.61	2141.839	2875.396	0.436613	1.91945	10.8242 (0.0045)
Nifty Pharma	3719.462	13209.01	1807.835	3449.425	0.786318	2.183454	18.839 (0.00008)
Nifty Private bank	4934.959	11126.36	976.937	3003.067	0.648795	2.259142	13.3957 (0.0012)
Nifty PSU bank	2802.621	5001.675	1242.089	870.5681	0.107418	2.289679	3.30426 (0.1916)
Nifty Financial Service	4268.922	8174.375	1205.57	1990.946	0.383392	2.141675	7.94807 (0.0188)
Descriptive Statistics of Macroeconomic Variables							
Forex reserve	14815.57	24701.05	6004.98	5401.3	0.21828	2.193397	5.04717 (0.0802)
WPI	147.9181	185.9	102.5	28.37663	-0.1361	1.473853	14.4192 (0.0007)
Bank rate	7.022187	10.25	6	1.314723	0.733932	1.858459	20.746 (0.00005)
Exchange rate	52.10862	68.238	39.37478	9.009758	0.443448	1.739958	14.246 (0.00081)
Crude oil prices	3867.162	6853.565	1955.342	1212.872	0.584292	2.266921	11.417 (0.0033)

Source: Compilation by Author

In the above table it can be observed that the mean value referred to as a central value of a discrete set of numbers indicate that Nifty FMCG sector has a highest average return among all the sectoral series. The volatility as given by standard deviation is higher for Nifty FMCG and Forex Reserves and lower for Nifty PSU Bank and bank rate. This reveals that Nifty PSU Bank shows least fluctuations indicating lower risk. Skewness indicates property of symmetry of data series wherein the data points lie within +/- 1. All the variables except nifty metal lies outside +/- 1 range and are positively skewed except inflation (WPI), which is negatively skewed. Kurtosis measures the peakness and flatness of the curve. The kurtosis data points for Nifty FMCG lies above three which indicates leptokurtic behavior of the data series featuring sharper peaks, longer and fatter tails on both the ends whereas all other variables follow a platykurtic distribution as their values are less than 3.

2. UNIT ROOT TEST (TEST FOR STATIONARITY)

Prior applying any econometric test stationary of each individual time series data needs to be examined otherwise it could lead to spurious regression. The study necessitates application of unit root test such as ADF to determine the Stationary of data.

Table 2: Result of stationarity for Macroeconomic Variables and Sectoral Indices series

Null Hypothesis: Macroeconomic Variables and Sectoral Indices series have unit root						
Particulars	T-statistics	Test Critical Values			Prob.*	Decision
		1% Level	5% Level	10%Level		
Nifty Auto	-9.27625	-3.476805	-2.881830	-2.577668	0.0000	Reject
Nifty Bank	-8.832064	-3.477144	-2.881978	-2.577747	0.0000	Reject
Nifty FMCG	-10.57392	-3.476805	-2.881830	-2.577668	0.0000	Reject
Nifty IT	-8.099205	-3.476805	-2.881830	-2.577668	0.0000	Reject
Nifty Metal	-15.50439	-3.476805	-2.881830	-2.577668	0.0000	Reject
Nifty Pharma	-8.967653	-3.476805	-2.881830	-2.577668	0.0000	Reject
Nifty PSU Bank	-8.730288	-3.477144	-2.881978	-2.577747	0.0000	Reject
Nifty Private Bank	-5.848285	-3.477487	-2.882127	-2.577827	0.0000	Reject
Nifty Financial Service	-8.561758	-3.477144	-2.881978	-2.577747	0.0000	Reject
Forex Reserve	-9.091952	-3.476805	-2.881830	-2.577668	0.0000	Reject
WPI	-7.133393	-3.476805	-2.881830	-2.577668	0.0000	Reject
Bank Rate	-9.360503	-3.477144	-2.881978	-2.577747	0.0000	Reject
Exchange Rate	-8.580966	-3.476805	-2.881830	-2.577668	0.0000	Reject
Crude oil prices	-8.390468	-3.476805	-2.881830	-2.577668	0.0000	Reject

Source: Compilation by Author

The above result exhibits that unit root is not present among any of the Indices and Macroeconomics variables at level. But it is stationary at first differences as the Augmented Dickey-Fuller (ADF) statistics is less than its critical value and even the probability values of all the series is less than 0.05. Therefore we reject the null hypothesis that there is a presence of unit root in the data series and accept the alternate hypothesis that there is no unit root. Thus we can conclude that the variables are stationary and integrated at order I (I).

3. COINTEGRATION

Cointegration indicates that when two individual non stationary series are combined their linear combination may provide for stationary. Such variables are cointegrated and move in same direction. There are two types of likelihood ratio test i.e. Trace test and Max Eigen value test. The present study employs Johansen Juselius test the most widely used test in understanding the association and long term trends in movement among variables.

Table 3: Result of Cointegration for Macroeconomic Variables and Sectoral Indices series

Particulars	Hypothesized No. of CE(s)	Eigen value	Trace Statistic	Critical Value	Prob.**
Nifty Auto	None	0.189932	71.71101	95.75366	0.6637
	At most 1	0.110841	42.43233	69.81889	0.9016
	At most 2	0.093887	26.10297	47.85613	0.8859
	At most 3	0.049905	12.39874	29.79707	0.9171
	At most 4	0.036577	5.282853	15.49471	0.7781
Nifty Bank	None	0.178616	68.61680	95.75366	0.7668
	At most 1	0.120537	41.26654	69.81889	0.9261
	At most 2	0.081150	23.41280	47.85613	0.9540
	At most 3	0.043800	11.64894	29.79707	0.9433
	At most 4	0.036818	5.423347	15.49471	0.7623
Nifty Financial service	None	0.173095	67.82526	95.75366	0.7907
	At most 1	0.122974	41.40624	69.81889	0.9234
	At most 2	0.078886	23.16686	47.85613	0.9583
	At most 3	0.045339	11.74501	29.79707	0.9404
	At most 4	0.036097	5.295518	15.49471	0.7767
Nifty PSU	None	0.168035	63.47938	95.75366	0.8968
	At most 1	0.117197	37.90832	69.81889	0.9727
	At most 2	0.076128	20.58152	47.85613	0.9876
	At most 3	0.043733	9.575196	29.79707	0.9858
	At most 4	0.023722	3.359396	15.49471	0.9482
Nifty IT	None	0.233379	78.08760	95.75366	0.4307
	At most 1	0.115461	41.14652	69.81889	0.9283
	At most 2	0.076313	24.09287	47.85613	0.9405
	At most 3	0.050145	13.05870	29.79707	0.8889
	At most 4	0.040611	5.907770	15.49471	0.7064
Nifty Metal	None	0.178148	64.49070	95.75366	0.8761
	At most 1	0.104662	37.21954	69.81889	0.9785
	At most 2	0.077207	21.85256	47.85613	0.9764
	At most 3	0.052539	10.68384	29.79707	0.9683
	At most 4	0.021423	3.182089	15.49471	0.9581
Nifty FMCG	None	0.172970	73.00468	95.75366	0.6171
	At most 1	0.132176	46.60663	69.81889	0.7756
	At most 2	0.075627	26.90107	47.85613	0.8580
	At most 3	0.070326	15.97015	29.79707	0.7144
	At most 4	0.039176	5.834119	15.49471	0.7150
Nifty Private bank	None	0.002006	0.279058	3.841466	0.5973
	None	0.173208	70.09327	95.75366	0.7194
	At most 1	0.124249	43.65519	69.81889	0.8707
	At most 2	0.081839	25.21354	47.85613	0.9129
	At most 3	0.051481	13.34544	29.79707	0.8752
Nifty Pharma	At most 4	0.039452	5.998853	15.49471	0.6957
	At most 5	0.002902	0.403926	3.841466	0.5251
	None	0.259378	84.81445	95.75366	0.2226
	At most 1	0.111936	43.07761	69.81889	0.8859
	At most 2	0.087825	26.57678	47.85613	0.8698
Nifty Pharma	At most 3	0.050344	13.79936	29.79707	0.8517
	At most 4	0.045510	6.619292	15.49471	0.6223
	At most 5	0.001042	0.144968	3.841466	0.7034

Source: Compilation by Author

In case of all sector indices it was found that the trace statistics value is less than critical values at 5% level of significance so we accept the null hypotheses and conclude that there is no long run association between the macroeconomic variables and each of the sectoral indices. So in the above table the trace statistics indicates existence of no cointegrating equations at 5% level of significance.

4. VECTOR AUTO REGRESSION MODEL (VAR)

VAR model has been used in the study to depict the short run autoregressing relationship between the variables.

Table 4: Results of VAR Model for Macroeconomic variables and each of the Sector Indices.

Table 4 (a) Result of VAR model for Nifty Auto and selected Macroeconomic variables

	Ln Nifty Auto (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Auto(-1)	0.2210	0.3725	0.8195	0.5218	0.1777	0.8000
Ln Nifty Auto(-2)	0.8424	0.9159	0.5721	0.6276	0.0221*	0.1228
Ln Bank Rate (-1)	0.8444	0.0000*	0.2852	0.2682	0.0461*	0.0621
Ln Bank Rate (-2)	0.3716	0.0001*	0.2299	0.8265	0.7380	0.5875
Ln crude oil prices (-1)	0.0147*	0.2165	0.0073*	0.7923	0.8392	0.0000*
Ln crude oil prices (-2)	0.5789	0.1573	0.9835	0.2579	0.2920	0.3119
Ln Forex rate (-1)	0.0762	0.7655	0.1735	0.0019*	0.1742	0.7040
Ln Forex rate (-2)	0.2381	0.4857	0.3848	0.4502	0.0067*	0.3074
Ln Forex Reserves (-1)	0.9210	0.0960	0.0146*	0.8309	0.0021*	0.1960
Ln Forex Reserves (-2)	0.0626	0.9977	0.9531	0.9086	0.2159	0.5957
Ln WPI (-1)	0.1191	0.2492	0.9036	0.9037	0.5607	0.1106
Ln WPI (-2)	0.7824	0.2651	0.9097	0.0472*	0.4029	0.2618
Constant	0.0043	0.7271	0.7393	0.7906	0.0085	0.0001

Table 4 (b) Result of VAR model for Nifty Bank and selected Macroeconomic variables

	Ln Nifty Bank (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Bank(-1)	0.0120*	0.6297	0.9983	0.9178	0.4322	0.4536
Ln Nifty Bank(-2)	0.0188*	0.6656	0.0132*	0.3421	0.2805	0.8385
Ln Bank Rate (-1)	0.3171	0.0000*	0.1745	0.3519	0.0957	0.0539
Ln Bank Rate (-2)	0.5171	0.0001*	0.2340	0.8100	0.7670	0.7440
Ln crude oil prices (-1)	0.1078	0.2954	0.0076*	0.9527	0.5881	0.0000*
Ln crude oil prices (-2)	0.6732	0.1396	0.9882	0.3326	0.1468	0.4363
Ln Forex rate (-1)	0.5395	0.7608	0.2158	0.0094*	0.2397	0.9775
Ln Forex rate (-2)	0.6495	0.4318	0.0592	0.7272	0.0159*	0.5436
Ln Forex Reserves (-1)	0.2233	0.0971	0.0097*	0.8071	0.0029*	0.2060
Ln Forex Reserves (-2)	0.7223	0.9217	0.7824	0.9576	0.2972	0.4828
Ln WPI (-1)	0.5790	0.2479	0.8753	0.8597	0.5988	0.1390
Ln WPI (-2)	0.8718	0.2537	0.9366	0.0447*	0.4828	0.2413
Constant	0.0209	0.6906	0.9868	0.8846	0.0105	0.0001

Table 4 (c) Result of VAR model for Nifty FMCG and selected Macroeconomic variables

	Ln Nifty FMCG (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty FMCG(-1)	0.6429	0.9271	0.6515	0.0081*	0.0003*	0.5423
Ln Nifty FMCG(-2)	0.8823	0.2098	0.5653	0.9724	0.5726	0.5443
Ln Bank Rate (-1)	0.7887	0.0000*	0.2666	0.2379	0.0616	0.0527
Ln Bank Rate (-2)	0.2637	0.0002*	0.2546	0.9110	0.8187	0.7110
Ln crude oil prices (-1)	0.0538	0.3935	0.0072*	0.5315	0.9198	0.0000*
Ln crude oil prices (-2)	0.6155	0.1365	0.9903	0.1656	0.0500*	0.6571
Ln Forex rate (-1)	0.9671	0.9105	0.1730	0.0002*	0.5092	0.6010
Ln Forex rate (-2)	0.9491	0.3324	0.4287	0.2101	0.0066*	0.6304
Ln Forex Reserves (-1)	0.3080	0.0723	0.0124*	0.9186	0.0033*	0.3129
Ln Forex Reserves (-2)	0.0506	0.9119	0.9632	0.6012	0.1356	0.6325
Ln WPI (-1)	0.9352	0.3733	0.9149	0.7505	0.9275	0.1014
Ln WPI (-2)	0.8266	0.3018	0.9178	0.0647	0.5314	0.2212
Constant	0.0022	0.6601	0.8171	0.3549	0.1355	0.0009

Table 4 (d) Result of VAR model for Nifty Metal and selected Macroeconomic variables

	Ln Nifty Metal (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Metal(-1)	0.0014*	0.9598	0.5617	0.0823	0.5675	0.4887
Ln Nifty Metal(-2)	0.5134	0.9799	0.5554	0.0096*	0.1688	0.3832
Ln Bank Rate (-1)	0.8168	0.0000*	0.2613	0.2754	0.1032	0.0578
Ln Bank Rate (-2)	0.9152	0.0001*	0.2336	0.7646	0.7567	0.7326
Ln crude oil prices (-1)	0.0535	0.2987	0.0075*	0.8952	0.4473	0.0000*
Ln crude oil prices (-2)	0.6776	0.1115	0.7688	0.6435	0.2419	0.5011
Ln Forex rate (-1)	0.0781	0.9573	0.2060	0.0053*	0.0489*	0.6560
Ln Forex rate (-2)	0.5761	0.5085	0.5122	0.2144	0.0227*	0.5654
Ln Forex Reserves (-1)	0.8402	0.1116	0.0182*	0.6534	0.0021*	0.2345
Ln Forex Reserves (-2)	0.8410	0.8939	0.9502	0.9531	0.3862	0.4883
Ln WPI (-1)	0.6576	0.2878	0.9786	0.5391	0.4106	0.1044
Ln WPI (-2)	0.3191	0.2378	0.8961	0.0412*	0.4026	0.2266
Constant	0.2055	0.5020	0.5171	0.6497	0.0039	0.0001

Table 4 (e) Result of VAR model for Nifty IT and selected Macroeconomic variables

	Ln Nifty IT (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty IT(-1)	0.0009*	0.9925	0.6615	0.9706	0.0550	0.8505
Ln Nifty IT(-2)	0.5027	0.4134	0.7141	0.0624	0.0066*	0.7849
Ln Bank Rate (-1)	0.8431	0.0000*	0.2722	0.3115	0.1366	0.0599
Ln Bank Rate (-2)	0.3463	0.0002*	0.2514	0.6940	0.6096	0.7621
Ln crude oil prices (-1)	0.2667	0.3217	0.0137*	0.8953	0.9998	0.0000*
Ln crude oil prices (-2)	0.5156	0.0723	0.9012	0.6702	0.3337	0.5214
Ln Forex rate (-1)	0.8250	0.9730	0.1999	0.0042*	0.0873	0.6649
Ln Forex rate (-2)	0.9029	0.5858	0.4235	0.2289	0.0072*	0.5271
Ln Forex Reserves (-1)	0.3823	0.1346	0.0148*	0.6177	0.0006*	0.2268
Ln Forex Reserves (-2)	0.2242	0.8229	0.9401	0.8856	0.4046	0.5419
Ln WPI (-1)	0.9611	0.2806	0.9715	0.8741	0.6867	0.0993
Ln WPI (-2)	0.5257	0.2313	0.8958	0.0555	0.4661	0.2399
Constant	0.7642	0.4323	0.5669	0.7791	0.0073	0.0002

Table 4 (e) Result of VAR model for Nifty Pharma and selected Macroeconomic variables

	Ln Nifty Pharma (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Pharma(-1)	0.0040*	0.6096	0.8913	0.5026	0.1620	0.2336
Ln Nifty Pharma(-2)	0.0567	0.9977	0.8723	0.2754	0.7063	0.9675
Ln Bank Rate (-1)	0.9926	0.0000*	0.2531	0.3182	0.0968	0.0512
Ln Bank Rate (-2)	0.5248	0.0001*	0.2333	0.7953	0.8771	0.6783
Ln crude oil prices (-1)	0.1594	0.2685	0.0077*	0.8757	0.6948	0.0000*
Ln crude oil prices (-2)	0.9743	0.1168	0.8788	0.2624	0.1343	0.6256
Ln Forex rate (-1)	0.8862	0.8237	0.2206	0.0022*	0.2194	0.4184
Ln Forex rate (-2)	0.3313	0.5444	0.4570	0.5708	0.0268*	0.5549
Ln Forex Reserves (-1)	0.9344	0.1056	0.0163*	0.8551	0.0031*	0.2638
Ln Forex Reserves (-2)	0.6553	0.9145	0.9475	0.9527	0.3508	0.5846
Ln WPI (-1)	0.6251	0.2831	0.9459	0.7549	0.5669	0.1002
Ln WPI (-2)	0.4904	0.2425	0.8770	0.0519	0.3954	0.2223
Constant	0.0564	0.5876	0.5939	0.7846	0.0168	0.0004

Table 4 (f) Result of VAR model for Nifty Pvt. Bank and selected Macroeconomic variables

	Ln Nifty Pvt. Bank (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Pvt. Bank (-1)	0.0042*	0.9009	0.7069	0.1637	0.1637	0.2944
Ln Nifty Pvt. Bank (-2)	0.0039*	0.4047	0.6856	0.2173	0.2173	0.6716
Ln Bank Rate (-1)	0.3708	0.0000*	0.3253	0.0930	0.0930	0.0606
Ln Bank Rate (-2)	0.5031	0.0001*	0.8100	0.8096	0.8096	0.7677
Ln crude oil prices (-1)	0.2104	0.3182	0.8752	0.7515	0.7515	0.0000*
Ln crude oil prices (-2)	0.5506	0.1558	0.2859	0.1527	0.1527	0.4527
Ln Forex rate (-1)	0.4483	0.9062	0.0059	0.4516	0.4516	0.8177
Ln Forex rate (-2)	0.4898	0.3115	0.5632	0.0133*	0.0133*	0.7767
Ln Forex Reserves (-1)	0.6238	0.0938	0.8379	0.0031*	0.0031*	0.2074
Ln Forex Reserves (-2)	0.6481	0.8373	0.9580	0.2581	0.2581	0.4355
Ln WPI (-1)	0.7029	0.2681	0.9382	0.7304	0.7304	0.1715
Ln WPI (-2)	0.6470	0.2915	0.0507*	0.5451	0.5451	0.2085
Constant	0.0106	0.7233	0.8178	0.0194	0.0194	0.0001

Table 4 (g) Result of VAR model for Nifty PSU and selected Macroeconomic variables

	Ln Nifty PSU (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices(Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty PSU(-1)	0.0029*	0.5466	0.3993	0.6894	0.4309	0.3597
Ln Nifty PSU(-2)	0.0218*	0.2980	0.1358	0.6371	0.0965	0.9987
Ln Bank Rate (-1)	0.2947	0.0000*	0.2418	0.3190	0.1138	0.0535
Ln Bank Rate (-2)	0.8849	0.0001*	0.2626	0.8238	0.7147	0.7473
Ln crude oil prices (-1)	0.2409	0.3557	0.0085*	0.9413	0.6445	0.0000*
Ln crude oil prices (-2)	0.8557	0.0909	0.9697	0.3107	0.1427	0.4384
Ln Forex rate (-1)	0.6435	0.7702	0.1198	0.0048*	0.2546	0.9330
Ln Forex rate (-2)	0.7286	0.2761	0.1529	0.5710	0.0071*	0.5881
Ln Forex Reserves (-1)	0.2776	0.1139	0.0120*	0.7994	0.0026*	0.2147
Ln Forex Reserves (-2)	0.5357	0.7733	0.9584	0.9482	0.2919	0.4686
Ln WPI (-1)	0.9224	0.3354	0.8185	0.9064	0.6117	0.1422
Ln WPI (-2)	0.9785	0.2902	0.9427	0.0534	0.5297	0.2178
Constant	0.2279	0.5083	0.9010	0.8937	0.0062	0.0001

Table 4 (h) Result of VAR model for Nifty Financial Service and selected Macroeconomic variables

	Ln Nifty Financial Service (Prob.)	Ln Bank Rate (Prob.)	Ln crude oil prices (Prob.)	Ln Forex Rate (Prob.)	Ln Forex Reserve (Prob.)	Ln WPI (Prob.)
Ln Nifty Financial Service (-1)	0.0021*	0.9236	0.7304	0.7321	0.1183	0.2699
Ln Nifty Financial Service (-2)	0.0241*	0.3515	0.0905	0.6936	0.1658	0.7821
Ln Bank Rate (-1)	0.3691	0.0000*	0.2127	0.3251	0.0877	0.0606
Ln Bank Rate (-2)	0.5779	0.0001*	0.2290	0.8090	0.8181	0.7696
Ln crude oil prices (-1)	0.3260	0.3340	0.0081*	0.8877	0.7967	0.0000*
Ln crude oil prices (-2)	0.7111	0.1559	0.8290	0.2911	0.1539	0.4383
Ln Forex rate (-1)	0.5001	0.9144	0.1725	0.0059*	0.4917	0.8009
Ln Forex rate (-2)	0.7909	0.2865	0.1230	0.5576	0.0109*	0.7037
Ln Forex Reserves (-1)	0.5547	0.0891	0.0085*	0.8321	0.0024*	0.2136
Ln Forex Reserves (-2)	0.6430	0.8474	0.8933	0.9495	0.2525	0.4391
Ln WPI (-1)	0.9394	0.2689	0.8153	0.9323	0.7575	0.1777
Ln WPI (-2)	0.6567	0.2995	0.9319	0.0518	0.5829	0.2092
Constant	0.0457	0.7142	0.9577	0.8403	0.0188	0.0001

In the body of all the above Tables (represent the Autoregression between the selected Sectoral Indices and selected macroeconomic variables) * denotes the significant criteria which means we reject the Null hypothesis and accept the Alternative hypothesis at 0.05 level. Thus the significant result in the tables has indicated with * which means that one and two lags of the variables have a short run influence on the current prices of the other variables.

5. VARIANCE DECOMPOSITION

Forecast error variance decomposition (FEVD) provides information on responses or variations in one variable with regard to fluctuations in other variables. It explains percentage of forecast variance i.e. how much fluctuations in one variable is explained by other variable over a specific time horizon. Variance decomposition can be exhibited either through the graph or in table form. The present study applies techniques of Innovation accounting namely variance decomposition and impulse response function to know the reaction of sectoral indices towards the shocks and Innovations in Macroeconomic factors (Forex rate, Forex reserve, Crude oil prices, Bank Interest rate, and the Inflation).

Table 5 Variance Decomposition for Macroeconomic Variables and Sectoral Indices series

Period	S.E.	Nifty bank	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.067514	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.071881	92.93823	0.202246	2.516502	2.701338	0.028639	1.613043
3	0.072946	90.30632	0.787940	2.625003	3.109686	1.585580	1.585467
4	0.073065	90.02663	0.787835	2.617112	3.105580	1.812108	1.650738
5	0.073224	89.66277	0.900541	2.606093	3.273249	1.890734	1.666612
6	0.073267	89.56774	0.927109	2.604581	3.337721	1.891537	1.671312
7	0.073277	89.54712	0.931553	2.610052	3.344376	1.894353	1.672549
8	0.073285	89.52880	0.944653	2.610119	3.343810	1.898140	1.674476
9	0.073289	89.51942	0.948042	2.611002	3.343905	1.902541	1.675090
10	0.073291	89.51485	0.948019	2.613337	3.344883	1.903860	1.675053
11	0.073291	89.51296	0.948054	2.614470	3.345511	1.903974	1.675028
12	0.073292	89.51261	0.948049	2.614744	3.345583	1.903965	1.675047

Period	S.E.	Nifty bank	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.073061	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.078639	96.08578	0.425637	1.180714	1.036210	1.073369	0.198294
3	0.079782	94.27660	0.436238	1.660115	2.021447	1.309425	0.296175
4	0.080357	94.26283	0.443263	1.638871	2.048821	1.297206	0.309010
5	0.080441	94.13695	0.443403	1.707623	2.072052	1.320022	0.319949
6	0.080491	94.05347	0.461449	1.746045	2.092959	1.321723	0.324358
7	0.080507	94.03788	0.467071	1.755457	2.093412	1.321390	0.324787
8	0.080509	94.03468	0.467255	1.757326	2.093492	1.322434	0.324814
9	0.080510	94.03208	0.468800	1.757497	2.093429	1.323252	0.324937
10	0.080511	94.03103	0.469124	1.757483	2.093744	1.323655	0.324966
11	0.080511	94.03046	0.469124	1.757574	2.094109	1.323765	0.324968
12	0.080511	94.03027	0.469143	1.757654	2.094190	1.323772	0.324974

Period	S.E.	Nifty FMCG	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.045716	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.046762	96.14227	0.000347	2.964238	0.158723	0.729702	0.004720
3	0.047673	92.58838	0.828445	2.864365	0.906670	2.791798	0.020346
4	0.047905	92.14317	0.846407	2.836758	0.945140	3.203835	0.024685
5	0.048037	91.66959	0.901913	2.927711	1.194465	3.262948	0.043376
6	0.048105	91.41120	0.934755	2.960336	1.385530	3.260892	0.047286
7	0.048112	91.38619	0.934675	2.959507	1.395277	3.272159	0.052196
8	0.048118	91.36315	0.941719	2.960181	1.401615	3.273237	0.060102
9	0.048121	91.35401	0.944388	2.960077	1.406743	3.273020	0.061764
10	0.048121	91.35178	0.944398	2.961885	1.406992	3.273186	0.061763
11	0.048121	91.35063	0.944532	2.962807	1.407022	3.273154	0.061855
12	0.048122	91.35042	0.944614	2.962882	1.407032	3.273176	0.061877

Period	S.E.	Nifty Private bank	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.311999	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.335164	93.01667	0.000395	3.834959	3.002862	0.016626	0.128485
3	0.337424	92.12343	0.000787	4.072018	3.237106	0.036005	0.530654
4	0.338030	92.01396	0.064945	4.101167	3.240413	0.041126	0.538385
5	0.338285	91.98103	0.087990	4.108134	3.241277	0.041065	0.540503
6	0.338388	91.93263	0.088003	4.143550	3.248937	0.041279	0.545601
7	0.338402	91.92544	0.088846	4.149177	3.248667	0.042283	0.545589
8	0.338411	91.92272	0.089419	4.150364	3.248967	0.042965	0.545567
9	0.338413	91.92145	0.089455	4.150433	3.249754	0.043352	0.545559
10	0.338414	91.92114	0.089455	4.150456	3.249947	0.043420	0.545577
11	0.338415	91.92104	0.089457	4.150475	3.250022	0.043420	0.545589
12	0.338415	91.92099	0.089465	4.150491	3.250025	0.043421	0.545603

Table 5(e) Variance Decomposition of Nifty IT

Period	S.E.	Nifty PSU	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.059451	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.063636	98.68896	0.068459	0.724094	0.024691	0.492222	0.001571
3	0.064575	97.24111	0.403159	0.780302	0.344451	1.027688	0.203289
4	0.065097	96.41262	0.603672	0.991742	0.506477	1.276298	0.209196
5	0.065230	96.12912	0.601756	1.022978	0.526252	1.478374	0.241516
6	0.065307	95.92458	0.621064	1.023655	0.603962	1.556868	0.269866
7	0.065332	95.86167	0.624515	1.029237	0.644791	1.568590	0.271199
8	0.065339	95.84522	0.624988	1.032068	0.655127	1.570781	0.271811
9	0.065341	95.83868	0.627612	1.032047	0.656739	1.571664	0.273257
10	0.065343	95.83557	0.628802	1.032564	0.657055	1.572043	0.273962
11	0.065343	95.83415	0.628935	1.033525	0.657146	1.572125	0.274122
12	0.065343	95.83358	0.628932	1.034070	0.657154	1.572118	0.274149

Table 5(f) Variance Decomposition of Nifty financial service

Period	S.E.	Nifty financial service	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.070739	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.077327	98.19060	0.363100	0.550323	0.666678	0.225708	0.003592
3	0.078006	96.75027	0.378116	0.938211	1.373203	0.409313	0.150890
4	0.078611	96.61820	0.386883	0.925103	1.453274	0.407269	0.209269
5	0.078713	96.52865	0.387263	0.987366	1.458736	0.409160	0.228826
6	0.078759	96.43228	0.410646	1.024093	1.489690	0.410157	0.233133
7	0.078779	96.40829	0.418356	1.034626	1.495509	0.409970	0.233246
8	0.078781	96.40476	0.418609	1.037460	1.495456	0.410288	0.233424
9	0.078783	96.40084	0.421040	1.037864	1.495563	0.411008	0.233686
10	0.078783	96.39958	0.421640	1.037849	1.495646	0.411540	0.233744
11	0.078784	96.39885	0.421640	1.037988	1.496084	0.411691	0.233746
12	0.078784	96.39851	0.421688	1.038106	1.496246	0.411697	0.233750

Table 5(f) Variance Decomposition of Nifty Pharma

Period	S.E.	Nifty Pharma	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.049988	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.052511	98.57080	0.010606	1.227075	0.017501	0.010181	0.163841
3	0.053135	96.46488	0.383216	1.549257	1.324170	0.030603	0.234785
4	0.053395	95.73786	0.461859	1.567692	1.862439	0.033172	0.336975
5	0.053429	95.62520	0.497575	1.634906	1.860403	0.033952	0.347966
6	0.053466	95.49483	0.563320	1.647687	1.875570	0.038534	0.378060
7	0.053473	95.46850	0.575739	1.651603	1.875389	0.047040	0.381726
8	0.053478	95.45347	0.575945	1.662495	1.877548	0.048870	0.381673
9	0.053479	95.44753	0.577265	1.665689	1.878946	0.048886	0.381682
10	0.053479	95.44681	0.577388	1.665892	1.878995	0.049211	0.381704
11	0.053480	95.44648	0.577448	1.665885	1.879074	0.049342	0.381771
12	0.053480	95.44625	0.577530	1.665884	1.879193	0.049352	0.381795

Table 5(g) Variance Decomposition of Nifty Private bank

Period	S.E.	Nifty Private bank	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.075868	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.082434	97.87232	0.377517	0.788446	0.684920	0.185440	0.091356
3	0.083820	95.45377	0.370359	1.364676	2.165712	0.309577	0.335907
4	0.084774	95.17076	0.385966	1.345290	2.412802	0.304191	0.380991
5	0.084903	94.98361	0.398687	1.472719	2.426417	0.314453	0.404115
6	0.085036	94.76925	0.460577	1.536859	2.504053	0.315476	0.413785
7	0.085075	94.73044	0.473504	1.553957	2.512104	0.315208	0.414787
8	0.085080	94.72064	0.475704	1.558780	2.513825	0.316098	0.414953
9	0.085087	94.71085	0.481947	1.559549	2.514745	0.317514	0.415392
10	0.085088	94.70868	0.482672	1.559503	2.515196	0.318499	0.415450
11	0.085089	94.70647	0.482829	1.559667	2.516834	0.318759	0.415439
12	0.085089	94.70577	0.482984	1.559844	2.517199	0.318767	0.415438

Table 5(h) Variance Decomposition of Nifty PSU

Period	S.E.	Nifty PSU	Bank rate	Crude oil prices	Exchange rate	Forex reserve	WPI
1	0.085315	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.092233	97.08056	0.486812	0.941703	0.746640	0.738197	0.006087
3	0.093597	94.93288	0.737529	1.491500	1.636160	1.195578	0.006349
4	0.094292	94.91274	0.733164	1.495476	1.661779	1.183640	0.013205
5	0.094378	94.82687	0.740573	1.503757	1.698252	1.203223	0.027324
6	0.094416	94.78004	0.742447	1.520992	1.715545	1.210773	0.030205
7	0.094429	94.77586	0.742548	1.525867	1.715083	1.210446	0.030199
8	0.094430	94.77337	0.743197	1.526108	1.715864	1.211174	0.030286
9	0.094431	94.77310	0.743217	1.526095	1.715853	1.211451	0.030288
10	0.094431	94.77290	0.743263	1.526089	1.715994	1.211469	0.030288
11	0.094431	94.77279	0.743294	1.526089	1.716071	1.211469	0.030290
12	0.094431	94.77277	0.743295	1.526089	1.716081	1.211471	0.030295

The above table 5(a) shows, FEVD of Nifty Auto prices indicating that 100% of its variance is explained by its own in the period one. After that it starts decaying but it can be seen that not major portion forecast error of Nifty Auto is explained by other factors. The contribution other macro factors increases but at a slower rate. Over the period of 12 months it is observed that only Exchange rate has major effect as compared to other macro variables on Nifty Auto index. The results also revealed that 100% of the variation in Nifty Bank Index is explained by its own in the first period. However from the period two onwards macroeconomic variables were capable of bringing variations in the Nifty Bank Index which is quite insignificant. In the period 12 it can be seen that around 94.03% of the variation in Nifty Bank Index is predominantly explained by its own whereas rest 5.97 % is explained by macroeconomic variables considered under the study. After a period of 12 months 96% of variation is explained by Nifty Financial Service sector itself while Bank rate (0.421%), Crude oil prices (1.038%), Exchange rate (1.496%), Forex reserve (0.4117%) and WPI (0.2337%). Over the period of 12 months it is observed that Exchange rate is the largest contributor to the predictive power of the Nifty Financial Service sector. In the above table 5(c), Nifty FMCG sector has explained 100% variation by itself .however during the period of time other variables influencing the Nifty FMCG sector has brought minor fluctuations. Over the passage of time, there has been increasing trend in macro factors in bringing fluctuations in the returns of the nifty FMCG but there predictive power is really less. The FEVD of nifty IT prices shows that primarily around 100%of its variance is explained by its own in the period one. After that it starts decaying but it can be seen that not major portion forecast error of nifty IT is explained by other factors. The above table gives conclusive evidence that there has been gradual decline in the nifty IT index.

In line with the other sectoral indices it can be seen that nifty metal index explains 100% of its own variations in the first month. However the relationship becomes much moiré clear as we move over a period of time. The crude oil

prices have a major influence whereas Forex reserves have very minor effect to bring variation in the nifty metal index. Throughout the period of 12 months it is predicted that all other factors are able to bring just minor changes into the prices of Nifty Pharma index which indicates a negligible role of all the macro factors in bringing variation in the Nifty Pharma index. The above table indicated that all the sectoral indices have shown the same behavior nifty private bank index by explaining 100% of its forecast variance on its own in first period. After a period of 12 months 94.70 % of variation is explained by nifty private bank itself while Bank rate (0.4830%), Crude oil prices (1.56%), exchange rate (0.89%), Forex reserve (2.517%) and WPI (0.4154 %). It is noted all the variables continue to have an increasing effect on the returns of private bank index.

7. GRANGER CAUSALITY TEST

The Granger’s causality test is a statistical concept based on prediction of causality & discovering the relationship between two variables and can be tested by the ability of measuring to predict values of another series i.e. to find lead lag relationship among the variables. The null hypothesis has been tested on the basis of the P-value. If the P-value is less than 5% level of significance than the null hypothesis is rejected and there will be a significant causal relation among the Macroeconomic variables and Sector Indices.

Table 7: Causality Test of Macroeconomic Variables and Sectoral Indices series

Pairwise Granger Causality Test			
Sectoral Indices	Null Hypothesis	F-Statistic	Prob*
Nifty Auto	Ln nifty auto does not granger cause Ln bank rate	0.31267	0.7320
	Ln bank rate does not granger cause Ln nifty auto	0.74939	0.4746
	Ln nifty auto doesn't granger cause in exchange rate	0.08600	0.9176
	Ln exchange rate doesn't granger cause Ln nifty auto	1.84776	0.1615
	Ln nifty auto doesn't granger cause Ln Forex reserve	2.24848	0.1095
	Ln Forex reserve doesn't granger cause Ln nifty auto	1.73943	0.1795
	Ln nifty auto doesn't granger cause Ln crude oil prices	0.04315	0.9578
	Ln crude oil prices doesn't granger cause Ln nifty auto	1.22070	0.2982
	Ln nifty auto doesn't granger cause Ln WPI	0.56734	0.5684
	Ln WPI doesn't granger cause Ln nifty auto	0.12865	0.8794
Nifty Bank	Ln nifty Bank does not granger cause Ln bank rate	0.30922	0.7345
	Ln bank rate does not granger cause Ln nifty bank	0.24666	0.7818
	Ln nifty bank doesn't granger cause Ln exchange rate	0.37204	0.6900
	Ln exchange rate doesn't granger cause Ln nifty bank	1.22812	0.2961
	Ln nifty bank doesn't granger cause Ln Forex reserve	1.77580	0.1733
	Ln Forex reserve doesn't granger cause Ln nifty bank	0.81826	0.4434
	Ln nifty bank doesn't granger cause Ln crude oil prices	0.49768	0.6090
	Ln crude oil prices doesn't granger cause Ln nifty bank	0.83242	0.4372
	Ln nifty bank doesn't granger cause Ln WPI	0.38678	0.6800
	Ln WPI doesn't granger cause Ln nifty bank	0.02566	0.9747
Nifty FMCG	Ln nifty FMCG does not granger cause Ln bank rate	0.30994	0.7340
	Ln bank rate does not granger cause Ln nifty FMCG	0.95155	0.3887
	Ln nifty FMCG doesn't granger cause Ln exchange rate	3.33077	0.0387**
	Ln exchange rate doesn't granger cause Ln nifty FMCG	0.58972	0.5559
	Ln nifty FMCG doesn't granger cause Ln forex reserve	7.21907	0.0010**
	Ln Forex reserve doesn't granger cause Ln nifty FMCG	2.99701	0.0532
	Ln nifty FMCG doesn't granger cause Ln crude oil prices	0.13959	0.8698
	Ln crude oil prices doesn't granger cause Ln nifty FMCG	1.36650	0.2585
	Ln nifty FMCG doesn't granger cause Ln WPI	1.58748	0.2082
	Ln WPI doesn't granger cause Ln nifty FMCG	0.17747	0.8376

Nifty Metal	Ln nifty Metal does not granger cause Ln bank rate	0.01660	0.9835
	Ln bank rate does not granger cause Ln nifty metal	0.00599	0.9940
	Ln nifty metal doesn't granger cause Ln exchange rate	3.87763	0.0239**
	Ln exchange rate doesn't granger cause Ln nifty metal	2.69921	0.0709
	Ln nifty metal doesn't granger cause Ln Forex reserve	0.23198	0.7933
	Ln Forex reserve doesn't granger cause Ln nifty metal	0.24676	0.7817
	Ln nifty metal doesn't granger cause Ln crude oil prices	0.70489	0.4960
	Ln crude oil prices doesn't granger cause Ln nifty metal	3.00899	0.0526
	Ln nifty metal doesn't granger cause Ln WPI	1.32992	0.2679
	Ln WPI doesn't granger cause Ln nifty metal	1.56805	0.2122
Nifty Pharma	Ln nifty pharma does not granger cause Ln bank rate	0.26101	0.7707
	Ln bank rate does not granger cause Ln nifty pharma	0.37825	0.6858
	Ln nifty pharma doesn't granger cause Ln exchange rate	1.02660	0.3610
	Ln exchange rate doesn't granger cause Ln nifty pharma	1.23460	0.2942
	Ln nifty pharma doesn't granger cause Ln Forex reserve	2.11485	0.1246
	Ln Fore reserve doesn't granger cause Ln nifty pharma	0.41709	0.6598
	Ln nifty pharma doesn't granger cause Ln crude oil prices	0.27080	0.7632
	Ln crude oil prices doesn't granger cause Ln nifty pharma	1.07942	0.3427
	Ln nifty pharma doesn't granger cause Ln WPI	1.77830	0.1728
	Ln WPI doesn't granger cause Ln nifty pharma	0.23837	0.7882
Nifty IT	Ln nifty IT does not granger cause Ln bank rate	0.19190	0.8256
	Ln bank rate does not granger cause Ln nifty IT	0.57063	0.5665
	Ln nifty IT doesn't granger cause Ln exchange rate	1.81878	0.1661
	Ln exchange rate doesn't granger cause Ln nifty IT	0.38442	0.6916
	Ln nifty IT doesn't granger cause Ln forex reserve	4.12403	0.0182**
	Ln Forex reserve doesn't granger cause Ln nifty IT	1.81383	0.1669
	Ln nifty IT doesn't granger cause Ln crude oil prices	0.09902	0.9058
	Ln crude oil prices doesn't granger cause Ln nifty IT	0.76171	0.4688
	Ln nifty IT doesn't granger cause Ln WPI	1.53782	0.2186
	Ln WPI doesn't granger cause Ln nifty IT	0.32229	0.7250
Nifty PSU	Ln nifty PSU does not granger cause Ln bank rate	0.01891	0.9813
	Ln bank rate does not granger cause Ln nifty PSU	0.27930	0.7567
	Ln nifty PSU doesn't granger cause Ln exchange rate	0.23145	0.7937
	Ln exchange rate doesn't granger cause Ln nifty PSU	1.01005	0.3669
	Ln nifty PSU doesn't granger cause Ln Forex reserve	1.56113	0.2136
	Ln Forex reserve doesn't granger cause Ln nifty PSU	0.77516	0.4627
	Ln nifty PSU doesn't granger cause Ln crude oil prices	0.15170	0.8594
	Ln crude oil prices doesn't granger cause Ln nifty PSU	0.59841	0.5311
	Ln nifty PSU doesn't granger cause Ln WPI	0.27554	0.7596
	Ln WPI doesn't granger cause Ln nifty PSU	0.15970	0.8526
Nifty Financial service	Ln nifty financial service does not granger cause Ln bank rate	0.07877	0.9243
	Ln bank rate does not granger cause Ln nifty financial service	0.25245	0.7773
	Ln nifty financial service doesn't granger cause Ln exchange rate	0.08007	0.9231
	Ln exchange rate doesn't granger cause Ln nifty financial service	0.73761	0.4802
	Ln nifty financial service doesn't granger cause Ln forex reserve	3.35500	0.0378**
	Ln forex reserve doesn't granger cause Ln nifty financial service	0.26422	0.7682
	Ln nifty financial service doesn't granger cause Ln crude oil prices	0.01224	0.9878
	Ln crude oil prices doesn't granger cause Ln nifty financial service	0.39782	0.6726
	Ln nifty financial service doesn't granger cause Ln WPI	0.64000	0.5289
	Ln WPI doesn't granger cause Ln nifty financial service	0.21409	0.8075
Nifty Private Bank	Ln nifty Private bank does not granger cause Ln bank rate	0.05897	0.9428
	Ln bank rate does not granger cause Ln nifty private bank	0.26187	0.7700
	Ln nifty private bank doesn't granger cause Ln exchange rate	0.07439	0.9283
	Ln exchange rate doesn't granger cause Ln nifty Private bank	1.26466	0.2856
	Ln nifty Private bank doesn't granger cause Ln forex reserve	3.09283	0.0486**
	Ln forex reserve doesn't granger cause Ln nifty Private bank	0.25478	0.7755
	Ln nifty Private bank doesn't granger cause Ln crude oil prices	0.10706	0.8986
	Ln crude oil prices doesn't granger cause Ln nifty Private bank	0.64636	0.5256
	Ln nifty Private bank doesn't granger cause Ln WPI	0.87832	0.4178
	Ln WPI doesn't granger cause Ln nifty Private bank	0.15128	0.8598

Note: ** indicates null hypothesis has been rejected 0.05 level.

Note: ** indicates null hypothesis has been rejected 0.05 level.

The above table shows the results of Granger causality test for macroeconomic variables and Nifty Sector Indices. In case of Nifty Auto, Nifty Bank, Nifty Pharma, Nifty PSU Index and Macroeconomic variables, the formulated null hypothesis of no causal relationship is accepted as the P value is more than 5% level of significance. So there exists an Independent causality running among these variables i.e. Macroeconomic variables and closing prices of all these indices are Independent in their characters. Any change in macroeconomic factors cannot be used to predict the future prices of these indices and viceversa. The results also concluded that Nifty FMCG shows a unidirectional relation with Forex Reserve and Exchange rate. Thus Nifty FMCG is a leading and influencing indicator for Exchange rate and Forex Reserve but reverse is not possible. It is evidence that one way causality exist between Nifty Financial service sector, Nifty Private Bank, Nifty IT and the Forex reserve as the null hypotheses of no cause and effect relationship among these variables is rejected since the p-value is less than 5%. The results also revealed that no other pairs of these variables show unidirectional as well as bidirectional relationship amongst themselves. Further, it is observed that one way

relationship exist between Nifty Metal and the exchange rate at 5% level of significance. An increase in Exchange rate will reflect in the stock prices of Nifty Metal sector. It is observed that there is no Bidirectional causality running among any two pairs of the variables. Bidirectional causality implies, whether the Macroeconomic variables considered under the study is useful in recording the future fluctuations in the prices of sectoral indices and whether the past prices of the sectoral indices are having any influence on the macroeconomic factors. This suggests that no two variables are interrelated and interdependent i.e. they don't have a feedback effect on each other.

V. CONCLUSION

The study has confined its scope to understand the dynamics of significant relationship between macroeconomic aggregates namely the Bank Interest Rate, Exchange Rate, Inflation (WPI), Crude oil prices and the Foreign Exchange Reserves of India and selected sector indices for a time period ranging from April 2005 to March 2017. Finally the analyses concluded no linkages and cointegrated long run synchronized movement between the macroeconomic variables and each of the Selected Sectoral indices. Further VAR Model has been employed to represent the short run autoregression among the selected variables. The results of Variance Decomposition test, an Innovation Accounting technique reveals that variations in the specific sector prices were mostly caused by its own variations whereas summation of all other macroeconomic factors has very minor effect. The causality relationship was tested through Granger Causality test and the results signify that there is no unidirectional as well as bidirectional causality running either way amongst the selected Macroeconomic variables and the closing prices of Nifty Auto, Nifty Bank, Nifty Pharma and Nifty PSU bank but there is cause and effect relationship amongst the rest of the variables. The study provides a useful tool for comparing the movement and direction of numerous sectors and thus beneficial for an investor in constructing a portfolio and diversification of risk amongst sectors. The outcomes of the research is also crucial for the company to predict fluctuations in prices and also information is available with respect to various factors which may affect Stock market which needs to be considered while floating their Share & Initial public offering.

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