

A study on Impact of Macroeconomic Variables on the Indian Stock Market with Reference to S&P CNX Nifty

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Abstract

It is evident from the common prudence that stock markets exhibit vulnerability to every change that surfaces the economic and non-economic spheres. Especially, the stocks which follow the main index like S& P Nifty are more volatile to the exogenous factors despite the strength of the fundamentals of the companies. But such volatility may last in short run due to few macro-economic factors and holds sway in long run owing to few other factors. Markets have become so delicate, that, the major indices of Sensex and Nifty have started shambling for virtual factors having no correlation with the market performance such as the economic turmoil of the countries having no nexus with the business of indices of the market index. Thus, it is essential to identify the crucial macroeconomic factors which impacts the indices to fortify the strategic portfolio decisions. In this Pursuit, a paper titled “Study on Impact of Macroeconomic Variables on Indian Stock Markets with Reference to S&P CNX Nifty” is brought forward.

Key words: Volatility, S&P CNX Nifty, Granger causality and Johansen co-integration

Introduction

It has been a global phenomenon that stock markets have got an irrevocable relationship with various economic and non-economic factors having direct or indirect influence on the

profitability of the companies listed in exchanges. This phenomenon is more perfectly attributed to semi strong form of markets like Indian stock markets where information on macroeconomic parameters is partially asymmetric. India represents one of the oldest and well integrated stock markets of Asia wherein the process of depending on the exchange index to make short run portfolio decisions had been a practice long in use. Because, it is believed that market index mirrors the impact of core economic factors on the major stocks which in turn leads to the fluctuations in the intraday prices or short run prices of other stocks but not on the long run prices. Because any market price in long run depends upon the microeconomic factors like dividend history, earnings per share and such other factors. This notion is being gradually set aside as macroeconomic data released on weekly or monthly basis such as call money, inflation, industrial output and foreign portfolio investments is leading to the abnormal market volatility and generating panic among the speculators and investors.

Any technical analysis reveals that, few macroeconomic indicators like global crude oil prices will have direct impact on the stocks of manufacturing entities in one direction and that of refineries in another direction. but the same macroeconomic indicator impacting the prices of stocks in service sector is a matter of concern to pen this paper. Similarly any changes in call money rates will have an impeccable relation with the stocks of Banks and NBFCs. But the same call money rates impacting the stock prices of retail sector shows an obvious need to understand the role of macroeconomic variables on markets as a whole. Accordingly, this paper reckons the monthly data pertaining to ten important macroeconomic variables to correlate the same with closing values of Nifty. The performance of Indian stock markets is better replicated through Nifty as it is the biggest index in terms of indices as well as the market capitalization. Nevertheless, the following literature is reviewed thoroughly before selecting the economic parameters.

Review of Literature

Mahajan (2017) has estimated that impact of macroeconomic variables on indices is more robust in the case of week and semi strong markets comparing to that of strong markets. he has conducted a comparative study on the correlations of economic variables and market indexes of NASDAQ and that of five other Asian and Europe markets to draw his conclusion. He strongly

felt that markets are not endemic for themselves, rather, they are more volatile to the external factors when information on such factors is feeble in the hands of investors.

Danial (2017) has conducted a study on international economic factors influencing the performance of domestic stock markets in short run and drew his conclusion that speculators often follows the news on external economies like currency rates, international interest indexes like LIBOR to take long positions in the markets. However, he explained in his paper that this phenomenon is exhibited by the wholesale speculators or institutional buyers taking speculative position. On the other hand, the retail speculators are more concerned about the domestic macroeconomic indicators in constructing short run portfolios.

Manjunathan (2017) has taken the daily trading volume of Nifty Senior for five years and constructed the intervals, when RBI announces the policy rates and established a trend line of Nifty movement for the selected time period of entire five years. The study observed that, there was abnormal fluctuations in all the intervals comparing to the normal average volume of trade. Thus, he made his conclusion that macroeconomic policy rates have got huge impact on Nifty in long run.

Nagpal (2017) has considered twenty qualitative factors like political shifts and changes in the board of directors of major companies and studied how such factors influence the markets at large. The found that these qualitative factors are very much macro in nature and impacted the prices of all the indices of Sensex and Nifty irrespective of the sector. Therefore, it is not apt to restrict macroeconomic factors only to few yardsticks. Rather, some microeconomic factors also converge into macro level variables as per as stock markets are considered. This paper has also considered international non parametric economic indicators and concluded that his hypothesis holds good for global markets either.

Patel (2017) has examined the nature of correlation existing between the market index and economic parameters. The study found that, it is not apt to see the unidirectional relation between the markets and independent factors impacting such markets. The study found that a vast majority of macroeconomic parameters have shown negative impact on the stock prices in the initial lags of their occurrence and gradually bounce back to normal position. Therefore, this paper made a critical comment in this conclusion that, only speculative prices and intraday prices

are affected by the macro economic data in Indian stock markets. This paper also observed that many speculators follow the index movements to take their positions in market and hardly place any emphasis on the true impact of macroeconomic aspects throwing shade on the stocks where they bet their investments.

Rajgopal (2018) in his applied GAP test on all the fifty indices of S&P Nifty for the selected time period of twenty six weeks and found that, Nifty is more volatile to the economic factors comparing to its counterpart indexes of Asian Markets like SGX. He has drawn his interpretation on the basis of Crude Oil prices, exchange rates and Fed rates to see which market of Asian segment is more sensitive to the macroeconomic variables and found that it is Nifty of the National Stock Exchange. Of course this hypothesis holds good for other major indexes of the country like Sensex as most of the speculators take positions in both NSE and BSE in same proportion.

Objectives of the Study

To test the stationarity of the S&P CNX Nifty and Selected Macro Economic Variables

To examine directional effect among the S&P CNX Nifty and Selected Macro Economic Variables

To examine the relationship between S&P NCX Nifty and Macro Economic Variables.

Data and Methodology

The present study is directed towards analysing the impact of Macro Economic variables to S&P CNX Nifty Index. The frequency of data is kept at Monthly and time span of the study is taken from April, 2014 to May 2018. The Nine macroeconomic variables Broad Money, Call Money Rate, Crude Oil Price, Exchange Rate, Foreign Institutional Investors, the Index of Industrial Production, Inflation Rate and Trade Balance were selected. The Monthly closing prices of S&P CNX Nifty from the website of www.nseindia.com and the database of RBI was used to gather the monthly data of all macroeconomic variables except crude oil prices which is taken from indexmundi.

FOLLOWING ECONOMETRIC MODELS WERE USED FOR ANALYSIS

Unit root test,
Granger causality test, and
Johansen cointegration test
Vector Error Correction Models

UNIT ROOT TESTS**Augmented Dickey-Fuller (ADF) Test**

The standard DF test is carried out by estimating the following Equation after subtracting y_{t-1} from both sides of the equation:

$$\Delta y_t = \alpha y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \epsilon_t$$

where $\alpha = \rho - 1$. The null and alternative hypotheses may be written as,

$$H_0: \alpha = 0$$

$$H_1: \alpha < 0$$

The Phillips – Perron test

The Phillips – Perron test is carried out by estimating the following equation

$$\Delta y_t = \alpha y_{t-1} + u_t$$

Where y_t is the time series data under consideration.

The KPPS (1992) Test is based on the residuals (ϵ_t) from an ordinary least square regression of the variable of interest on the exogenous variable(s) as follows:

$$Y_t = X_t' \beta + \epsilon_t \quad (2)$$

where Y_t is the variable of interest (real exchange rate) and X_t is a vector of exogenous variable(s). The Lagrange Multiplier (LM) statistic used in the test as follows:

$$TM = T^{-2} \sum_{i=1}^t S(t)^2 / f_0$$

where T is the sample size, $S(t)$ is the partial sum of residuals which is calculated as

$$S(t) = \sum_{i=1}^t S r$$

Here ε_t is the estimated residual from (3.1). f_0 is an estimator of the residual spectrum at frequency zero. This statistic has to be compared with KPSS et al. (1992) critical values.

Granger causality test

The test was carried out to identify the directional effect of selected indices. To test for Granger causality, the following two equations were estimated.

$$Y_t = \sum_{i=1}^m \alpha_i Y_{t-i} + \sum_{i=1}^m \beta_i X_{t-i} + u_t$$

$$X_t = \sum_{i=1}^m \gamma_i Y_{t-i} + \sum_{i=1}^m \delta_i X_{t-i} + e_t$$

Johansen cointegration test

The condition for testing Johansen cointegration test for any time series data is that the data should be non-stationary at their level i.e. the natural logarithm of time series data should be non stationary and the first difference in the data should be stationary. If the return indices of different markets are correlated, the value may rise or fall. On the other hand, if the time series data are cointegrated, then the series in the long run will come to equilibrium point.

Table 1: Selected Macro Economic Variables and Major Stock Market Indices

Name of the Variables	Proxy Used
S&P CNX Nifty	Monthly Closing Index

Foreign Institutional Investments	Net Investments in Rs.Billion
Gold Price	Price Traded in Mumbai 10 grams
Crude Oil Price	Indian Rupee per Barrel
Exchange Rate	Average Rupee per unit of US\$
Inflation Rate	Whole sale price Index
Trade Balance	Trade Balance in Rs.Billion
Money Supply	Broad Money (M3) in Rs.Billion
Call Money Rate	Weighted Average Call Money Rates
Index of Industrial Production	General Index Numbers of Industrial Production

Table 2: showing unit root test results

	Augmented Dickey-Fuller test statistic		Phillips-Perron test statistic		Kwiatkowski-Phillips-Schmidt-Shin test statistic	
	Level	1st Difference	Level	1st Difference	Level	1st Difference
S&P CNX Nifty	-1.051829 (0.7273)	-6.370602 (0.0000)	-1.166271 (0.6817)	-6.362245 (0.0000)	0.606294	0.200511
FII	-4.878307 (0.0082)	-10.76882 (0.0000)	-4.890541 (0.0002)	-20.50745 (0.0001)	0.297427	0.196365
Gold Price	-1.998116 (0.2867)	-6.813942 (0.0000)	-2.054756 (0.2634)	-6.831469 (0.0000)	0.354284	0.115087
Oil Price	-1.017761 (0.7397)	-6.576688 (0.0000)	-0.984420 (0.7518)	-6.576686 (0.0000)	0.345920	0.33465
Exchange Rate	-1.64004 (0.4529)	-7.658909 (0.0000)	-1.482334 (0.5341)	-9.956650 (0.0000)	0.450703	0.293841
Inflation Rate	-1.958696 (0.3036)	-4.454533 (0.0088)	-1.231201 (0.6536)	-4.274627 (0.0014)	0.215223	0.277536
Trade Balance	-3.227030	-8.326551	-3.253115	-17.34850	0.297040	0.392658

	(0.0243)	(0.0000)	(0.0228)	(0.0000)		
M3	-3.346019 (0.0180)	-2.975492 (0.0451)	-3.243059 (0.0233)	-18.94510 (0.0001)	0.517003	0.50000
CMR	0.678904 (0.9904)	-7.493338 (0.0000)	-1.219121 (0.6590)	-8.518674 (0.0000)	0.736303	0.596203
IIP	-5.385641 (0.0000)	-10.74050 (0.0000)	-5.411476 (0.0000)	-17.99258 (0.0000)	0.127552	0.50000
91 Days T-Bills	-0.550771 (0.8715)	-7.828894 (0.0000)	-0.859373 (0.7923)	-6.465173 (0.0000)	0.717870	0.613001

Note: ADF and PP Test critical values: 1% level -3.48, 5% level -2.88, 10% level -2.57;

KPSS Asymptotic critical values: 1% level 0.73, 5% level 0.46, 10% level 0.34.

From the Table 2, it is clear that all the variables except FIIs were non-stationary at level with intercept. It attained stationarity at 5% significance level; however, the actual p-value of all other variables was greater than the critical P-value hence found non-stationary at level. Nifty, Call Money Rate, Crude Oil price, Exchange Rate, Foreign Exchange Reserve, Gross Fiscal Deficit, Inflation Rate and Trade Balance became stationary at Ist Difference and Broad Money and Index of Industrial Production at IInd difference.

Table 3: Results of Pairwise (Granger) Causal Test

Null Hypothesis	F-Statistics	Prob.	*Decision	Relationship
FIIs does not Ganger Cause S&PCNX Nifty	3.88045	0.0282	Rejected	Causality
S&PCNX Nifty does not Granger Cause FIIs	1.64516	0.2058	Accepted	no causality
Gold Price does not Ganger Cause S&PCNX Nifty	1.96293	0.1528	Accepted	No causality
S&PCNX Nifty does not Granger Cause Gold Price	3.87231	0.0284	Rejected	causality

Oil Price does not Ganger Cause S&PCNX Nifty	1.61029	0.2116	Accepted	no causality
S&PCNX Nifty does not Granger Cause Oil Price	1.41006	0.2552	Accepted	no causality
Exchange Rate does not Ganger Cause S&PCNX Nifty	2.93183	0.0640	Accepted	no causality
S&PCNX Nifty does not Granger Cause Exchange Rate	1.12026	0.3355	Accepted	no causality
Inflation Rate does not Ganger Cause S&PCNX Nifty	2.60971	0.0852	Accepted	no causality
S&PCNX Nifty does not Granger Cause Inflation Rate	0.13742	0.8720	Accepted	no causality
Trade Balance does not Ganger Cause S&PCNX Nifty	0.42842	0.6543	Accepted	no causality
S&PCNX Nifty does not Granger Cause Trade Balance	1.83503	0.1719	Accepted	no causality
Money Supply (M3) does not Ganger Cause S&PCNX Nifty	1.32501	0.2764	Accepted	no causality
S&PCNX Nifty does not Granger Cause Money Supply (M3)	3.65027	0.0343	Rejected	causality
Call Money Rate (CMR) does not Ganger Cause S&PCNX Nifty	3.88045	0.0282	Rejected	Causality
S&PCNX Nifty does not Granger Cause Call Money Rate (CMR)	0.42325	0.6576	Accepted	no causality
Index of Industrial Production (IIP) does not Ganger Cause S&PCNX Nifty	1.33037	0.2750	Rejected	Causality

S&PCNX Nifty does not Granger Cause Index of Industrial Production (IIP)	0.31528	0.7313	Accepted	no causality
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Note: Pairwise Granger Causality tests are performed on the first differences of logged variables.

*Decisions are made at 5% significance level.

Pair wise Granger Causality Tests Results

The Granger causality test is a statistical proposition test for determining whether one time series is helpful in forecasting another. The pairwise Granger causality test has been performed in the present study in search of direction of causation among the selected variables and S&P CNX Nifty.

Table-3 reveals that no causality exists between S&P CNX Nifty and FIIs, Gold Price and S&P CNX Nifty, S&P CNX Nifty and Oil Price, Oil Price and S&P CNX Nifty, Exchange Rate and S&P CNX Nifty vice versa, Inflation Rate and S&P CNX Nifty vice versa, Trade Balance and S&P CNX Nifty vice versa, Money Supply and S&P CNX Nifty, S&P CNX Nifty and Call Money Rate, S&P CNX Nifty and IIP. Thus the calculated p-values found greater than critical p-value and results shown that no unidirectional between the variables. The Bidirectional causality exists between FIIs and S&P CNX Nifty, S&P CNX Nifty and Gold Price, S&P CNX Nifty and Money Supply, Call Money Rate and S&P CNX Nifty, IIP and S&P CNX Nifty. Thus the calculated p-values are less than the critical p-value and results found that bidirectional relationship between FIIs, Call Money Rate and Index on Industrial Production.

Table 4: showing the Johnsen cointegration test result (lags interval: 2)

Symbol	Hypothesized No.of CE(s)	Eigen Value	Trace Test			Maximum Eigen Value test		
			Test Sta.	P.Value* *	Critical value at 5%	Test Sta.	P.Value**	Critical value at 5%
S&P CNX	H0:r=0(None)	0.298484	19.142	0.0135	15.49	17.016	0.0179	14.264

Nifty and FIIs			22		47	57		6
	H1:r≤1	0.043318	2.1256	0.1449	3.841	2.1256	0.1449	3.8414
	At Most 1		43		47	43		7
S&P CNX Nifty and Gold Price	H0:r=0(None)	0.152934	8.6094	0.4027	15.49	7.9668	0.3821	14.264
			26		47	58		6
	H1:r≤1	0.013298	0.6425	0.4228	3.841	0.6425	0.4228	3.8414
	At Most 1		68		47	68		7
S&P CNX Nifty and Crude Oil Price	H0:r=0(None)	0.127113	7.0106	0.5764	15.49	6.5255	0.5467	14.264
			96		47	78		6
	H1:r≤1	0.010056	0.4851	0.4861	3.841	0.4851	0.4861	3.8414
	At Most 1		17		47	17		7
S&P CNX Nifty and Exchange Rate	H0:r=0(None)	0.096057	4.9455	0.8146	15.49	0.0960	0.7610	14.264
			57		47	57		6
	H1:r≤1	0.002041	0.0980	0.7541	3.841	0.0020	0.7541	3.8414
	At Most 1		77		47	41		7
S&P CNX Nifty and Inflation Rate	H0:r=0(None)	0.142687	7.8278	0.4840	15.49	7.3897	0.4441	14.264
			74		47	00		6
	H1:r≤1	0.009087	0.4317	0.5080	3.841	0.4381	0.5080	3.8414
	At Most 1		4		47	74		7
S&P CNX Nifty and Trade Balance	H0:r=0(None)	0.224063	13.848	0.0872	15.49	12.176	0.1042	14.264
			43		47	86		6
	H1:r≤1	0.034225	1.6715	0.1960	3.841	1.6715	0.1960	3.8414
	At Most 1		74		47	74		7
S&P CNX Nifty and Money Supply (M3)	H0:r=0(None)	0.251345	14.938	0.0605	15.49	13.894	0.0531	14.264
			71		47	93		6
	H1:r≤1	0.021511	1.0437	0.0369	3.841	1.0437	0.3069	3.8414
	At Most 1		83		47	83		7

S&P CNX Nifty and Call Money Rate (CMR)	H0:r=0(None)	0.105650	5.3795 00	0.7673	15.49 47	5.3596 13	0.6959	14.264 6
	H1:r≤1 At Most 1	0.000414	0.0198 87	0.8873	3.841 47	0.0198 87	0.8878	3.8414 7
S&P CNX Nifty closing and Index of Industrial Production (IIP)	H0:r=0(None)	0.291241	17.627 24	0.0231	15.49 47	16.523 49	0.0216	14.264 6
	H1:r≤1 At Most 1	0.023651	1.1488 70	0.2838	3.841 47	1.1488 70	0.2838	3.8414 7

** Mackinno-Hung-Michelis(1999) P-values

*denotes rejection of the Hypothesis at the 0.05 level

Trace test indicates 2 co integrating egn(s) at the 0.05 level

Table 4 presents the results of Johansen's (1991) maximum likelihood co-integration test results which examines whether the Nifty and selected Macro Economic Variables are co-integrated. The result shows that first null hypothesis is 'none' which means that there is no co-integration equation among the variables. The value of the trace-statistics is more than critical value we can reject null hypothesis. Here the value of trace statistics is 19.14222 (FIIs) and 17.62724 (Index of Industrial Production) critical value at 5 per cent is 15.4947. Thus the trace statistics of FIIs and IIP are more than the critical value that means we can reject the null hypothesis. Here the probability value is very small that is less than 0.05 so the study rejects the null hypothesis of 'none'. The second null hypothesis is 'atmost 1'. It means that there is one co-integration model. Here the trace statistics of the selected macro-economic variables are less than the critical value is 3.84147 which means that the study accepted the null hypothesis and that there a exists co-integration model. Again the p-value of the selected variables which is more than 0.05 which indicates the accept the null hypothesis of both 'none' (except FIIs and IIP) and 'atmost 1'. Thus the selected macro-economic variables of the study have long run equilibrium relationship between them.

Conclusions

It is plausible to conclude from the statistical inferences that the S& P Nifty is very much vulnerable to innumerable exogenous factors nevertheless there are few determinants showing strong correlation with the indices listed therein. However, it is not apt to state that all the macro economic variables exhibit equally strong correlation with the indices of Nifty, as most of the closing values of the selected index have shown speculative trends irrespective of the economic repressors. Especially, the residuals of multi colinierity test makes it obvious that any change in few strong indices with huge market capitalization has had an impeccable impact on the other indices in the selected time period irrespective of the sector from which they are listed. But, it is evinced from the data analysed in this paper that crucial macroeconomic determinants of market performance like Foreign Portfolio Investments, crude oil prices and bank rates have got an inexorable nexus with the indices of Nifty. Thus, it is rational to ultimately conclude that a vast majority of the macro economic variables impacts the markets as a whole in the long run.

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