An Analysis of the Macroeconomic Variables Impacting the Indian Stock Market at NSE Nifty 50

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Abstract

The main purpose of the study was to understand a long-term relationship of the external macroeconomic factors and the Nifty 50 index of the National Stock Exchange (NSE). Five major macroeconomic factors namely, foreign exchange reserves, prices of crude oil, foreign institutional investment, balance of payments, and gold prices were considered to know the cause of these external macroeconomic factors on NSE Nifty 50. Monthly data of the above variables were being considered for the study from January 2016 to December 2020, that is, for a period of 5 years. To understand the relationship among the variables, an attempt was made to use the Augmented Dickey – Fuller (ADF) test to ascertain whether the data used were stationary or not, and to know the extent of influence of independent variables on dependent variables by running the multiple regression. It was observed that out of all the factors considered for the study, bearing crude oil, no factor had a relationship with the market index (NSE Nifty 50). It was also found that the stock market became a weak form as no significant relationship existed during the study period.

Keywords : **macro economy, stock market, NSE Nifty 50, descriptive statistics, correlation, regression technique**

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The stock market is a part of the financial system of a country as it talks about its financial stability besides playing an important role in providing funds to the needy organizations from savers. The performance of stock markets can be assessed through its market index. Therefore, it is one of the criterions to evaluate the performance of a particular stock because its movement is very much susceptible to the changes concerning the external factors. It can be domestic or global. The existence of the relationship between stock performance of the stock and the external macroeconomic factors is the keystone for the researchers and any economists because the external macroeconomic actions always bring a good amount of influence on returns from the stock market index. India is mainly depending on importing crude oil, acquiring technology, and obtaining foreign investment from the other countries to keep up its growth pace. In view of the facts stated above, the study is aimed at analyzing the impact of the external macroeconomic factors on the performance of the NSE Nifty 50 stock market index.

Review of Literature

A large number of studies have been conducted across countries in order to examine the association between factors relating to macroeconomic variables and prices of stocks. In this regard, the earlier research works undertaken are discussed in the following paragraphs.

Chen et al. (1986) used a set of external macroeconomic factors by using equity returns as a function of

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macroeconomic variables and returns from assets other than equity for US. The results showed that the external macroeconomic factors, namely industrial production, inflation anticipated and unanticipated, yield spread between the long and short term government bonds were extensively explained by the stock returns.

Mukherjee and Naka (1995) assessed the relationship between returns from the Singapore stock market and four macroeconomic factors, that is, narrow and broad supply of money, exchange rates, and reserves in foreign exchange. They used monthly data from October 1984 to April 1993. They found that both narrow and broad supply of money and reserves in foreign exchange continued to display a long run relationship with stock prices ; whereas, exchange rates did not.

Pethe and Karnik (2000) made an attempt to examine the indices affected by various crucial external macroeconomic variables in India using the data pertaining to the Indian economy from April 1992 to December 1997. Their study reported weak form of stock market. In other words, stock prices had a considerable effect on the Indian economy.

Ratanapakorn and Sharma (2007) examined a long and short term connection between macroeconomic variables and US stock index (S&P 500) since April 1975 to March 1999. Their results yielded a negative relationship between long term interest rate and stock market index. However, it was proved that there existed a positive relationship among other variables.

Objectives of the Study

(1) To understand the diverse global factors affecting the Indian economy.

(2) To examine the impact of changes in the global factors on the selected index – NSE Nifty 50.

Research Methodology

Data Description and Techniques

The study has considered the market index NSE Nifty 50 as one of the dependent variables and five different macroeconomic variables as independent variables for the period from January 2016 to December 2020 for a period of five years (i.e., 01.01.2016 to 31.12.2020). To carry out the study, monthly time series data have been used. The other required data were collected from RBI Bulletin and NSE India website. The Augmented Dickey–Fuller (ADF) test and multiple regression techniques are being employed to assess the impact of external macroeconomic factors on Indian economy represented by NSE Nifty 50. The study is restricted to five external macroeconomic factors namely crude oil price, exchange rate, foreign institutional investments, gold prices, and foreign exchange reserves.

Techniques Used

The Augmented Dickey–Fuller (ADF) test and multiple regression techniques are applied through E-VIEWS to find out the association between external macroeconomic factors and prices of the stock market index. The ADF test has been applied to check the stationary of the data. When the data became stationary, then the multiple regression was applied to find out the significant variables.

Hypotheses

- **$H0_1$:** The selected variable is not stationary.

- **Ha_1 :** The selected variable is stationary.
- **$H0_2$:** The series is not normally distributed.
- **Ha_2 :** The series is normally distributed.
- **$H0_3$:** There is no significant association between selected macroeconomic variables and NSE Nifty 50.
- **Ha_3 :** There is a significant association between selected macroeconomic variables and NSE Nifty 50.

Theoretical Background of the Multiple Regression Model

Multiple regression is a statistical technique applied to evolve the dependency of the index at NSE Nifty 50 on the different macroeconomic factors. This kind of relationship is tested by applying the following equation :

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + U \quad \text{..... (1)}$$

where,

Y indicates return on NSE Nifty 50, α is the intercept, X_1, X_2, X_3, X_4, and X_5 are various variables abbreviated as *CROIL*, *Goldp*, *FII*, *FER*, *BOP*, respectively. $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 are the regression coefficients of X_1, X_2, X_3, X_4, and X_5, respectively. They explain that if there is one unit change in the dependent variable how much it causes variation in the independent variable. The importance of the coefficients can be assessed by either test critical-values or probability-values. If probability values obtained are less than the significance level of 5%, then the null hypothesis is rejected and accepted when probability values are more than the significance level at which the hypothesis is considered.

Analysis and Results

From Table 1, it is very clear that all variables except FIIs have become non-stationary at 5% significance level with intercept. From Table 2, it can be inferred that all the variables attained are stationary at 5% significance level. NSE Nifty 50 and all macroeconomic variables have become stationary at the first difference.

From Table 3, we can observe that the probability-value is less than the significant value (0.05) in all the variables except gold price. We can reject the null hypothesis (i.e., $H0_2$) leading to the conclusion that we can accept the alternative hypothesis (i.e., Ha_2). It means that the series is normally distributed except gold price which is not normally distributed.

Table 1. ***Augmented Dickey – Fuller Test Statistics with Intercept***

Variables	Test Critical Values @5% level	*t* - Statistic	*R* - Squared	Adjusted *R* -Squared	Prob.*	Null Hypothesis (H0)	Result
BOP	–2.911730	–3.398182	0.168462	0.153873	0.0149	$H0_1$ is accepted	Non stationary
CRUDEOIL	–2.912631	–2.773782	0.216411	0.187917	0.0683	$H0_1$ is accepted	Non stationary
FER	–2.912631	3.290776	0.283027	0.256956	1.0000	$H0_1$ is accepted	Non stationary
FII	–2.911730	–7.512027	0.497490	0.488674	0.0000	$H0_1$ is accepted	Stationary
GOLD	–2.911730	0.344729	0.002081	–0.015427	0.9788	$H0_1$ is accepted	Non stationary
NSE(Y)	–2.911730	–1.045777	0.018826	0.001612	0.7312	$H0_1$ is accepted	Non stationary

Table 2. ***Augmented Dickey – Fuller Test Statistics with Intercept After Converting Non - Stationary Data into Stationary Data***

Variables	Test Critical Values @5% Level	*t* - Statistic	*R* - Squared	Adjusted *R* - Squared	Prob.*	Null Hypothesis (H0)	Result
DBOP	–2.912631	–7.905286	0.527400	0.518961	0.0000	$H0_1$ Rejected	Stationary
DCRUDDOIL	–2.913549	–5.653689	0.389170	0.366547	0.0000	$H0_1$ Rejected	Stationary
DFER	–2.912631	–10.75853	0.673937	0.668115	0.0000	$H0_1$ Rejected	Stationary
DFII	2.913549	–8.229978	0.779730	0.771572	0.0000	$H0_1$ Rejected	Stationary
DGOLD	–2.9126	–5.8856	0.382172	0.371139	0	$H0_1$ Rejected	Stationary
DNSE (Y)	–2.9126	–7.263053	0.485067	0.475871	0	$H0_1$ Rejected	Stationary

Table 3. ***Descriptive Statistics of the Variables Selected***

	DNSE	*DGOLDPRICE*	*DFII*	*DFER*	*DCRUDEOIL*	*DBOP*
Mean	108.7864	13.17441	41.23729	330.9408	0.434746	–3.501356
Median	130.3	8.34	0	230	2.58	0
Maximum	1326.55	122.12	14437	3450	21.8	1612
Minimum	–2604	–80.99	–14581	–4252	–50.31	–1308
Std. Dev.	579.9439	43.14121	3144.943	922.1565	12.43653	337.3929
Skewness	–1.523808	0.531696	–0.170785	–1.19448	–1.543834	0.836998
Kurtosis	9.636732	3.026709	16.23617	13.72662	6.925051	14.16841
Jarque –Bera	131.1132	2.78164	430.9773	296.8869	61.31014	313.5252
Probability	0	0.248871	0	0	0	0
Sum	6418.4	777.29	2433	19525.51	25.65	–206.58
Sum Sq. Dev.	19507423	107947.5	5.74E+08	49321615	8970.697	6602370
Observations	59	59	59	59	59	59

Note. Skeweness : Shows the asymmetry distribution of the series around the mean.

Kurtosis : Indicates the peakedness of the distribution of the series.

As the kurtosis value is greater than value of 3 in all the variables, it is known as leptokurtosis.

Jarque – Bera is applied to test whether the series is normally distributed or not.

Correlation Study

To analyze the relationship between NSE Nifty 50 and the various macroeconomic factors, Karl Pearson's correlation coefficient has been applied and the results of the same are depicted in Table 4, considering each external macroeconomic factors as a yardstick.

- **Gold Price (Gold Price) :** Gold price has low correlation with other variables under the study.
- **Crude Oil (Crude Oil) :** It has high correlation with all the variables.
- **Foreign Institutional Investments (FII) :** FIIs are at higher side except crude oil.
- **Balance of Trade (BOP) :** Balance of trade is found to be in a negative and positive with other variables.
- **Foreign Exchange Reserves (FOREX) :** It is having moderate correlation with other variables.

Table 4. ***Correlation of the Variables Selected***

	DNSE	*DGOLDPRICE*	*DFII*	*DFER*	*DCRUDEOIL*	*DBOP*
DNSE	1.000000	–0.002519	–0.202109	0.075746	0.345388	0.018794
DGOLDPRICE	–0.002519	1.000000	0.012048	–0.010155	–0.136353	–0.155093
DFII	–0.202109	0.012048	1.000000	0.217901	–0.122805	–0.080057
DFER	0.075746	–0.010155	0.217901	1.000000	–0.094065	0.003839
DCRUDEOIL	0.345388	–0.136353	–0.122805	–0.094065	1.000000	0.242915
DBOP	0.018794	–0.155093	–0.080057	0.003839	0.242915	1.000000

Table 5. ***Results of Multiple Regression***

Variables	Coefficient	Standard Error	Test-Statistic	Probability	Results
C	63.80774	80.06947	0.796905	0.4291	Accepted $H0_3$
DGOLDPRICE	0.513889	1.707811	0.300905	0.7647	Accepted $H0_3$
DFII	–0.036539	0.023756	–1.538086	0.1300	Accepted $H0_3$
DFER	0.096518	0.080696	1.196081	0.2370	Accepted $H0_3$
DCRUDEOIL	16.78452	6.085729	2.758012	0.0080	Accepted Ha_3
DBOP	–0.136072	0.223429	–0.609014	0.5451	Accepted $H0_3$
***R*-squared**	0.174405	**Mean Dependent Var**	108.7864		
Adjusted *R*-squared	0.096518	***S.D.* Dependent Var**	579.9439		
S.E. of regression	551.2462	**Akaike Info Criterion**	15.55838		
Sum squared residual	16105236	**Schwarz Criterion**	15.76966		
Log likelihood	–452.9723	**Hannan – Quinn Criter**	15.64086		
***F*-statistic**	2.239221	**Durbin – Watson Stat**	2.241541		
Prob (*F*-statistic)	0.063751				

From Table 5, it can be inferred that all the macroeconomic factors except crude oil are insignificant at the 5% significance level. All the selected variables except crude oil are found to be insignificant in establishing any relationship with its dependent variable whose probability-value is 0.0080, which is less than the significant value of 0.05. This exhibits a significant influence on NSE Nifty 50. The Durbin – Watson statistic implies that there exists no autocorrelation as the value obtained is 2 after running the regression. R^2 gives the percentage of the total variation in the dependent variable, which is explained by the independent variables.

The *R* - square value is 0.17, indicating that the dependent variable is explained by the independent variables to the extent of 17%. The other 83% of the variation in the dependent variable is explained by other variables which are not considered in our study.

Conclusion

The major purpose of this paper is to figure out whether the Indian stock market is affected by changes in external macroeconomic variables. To confirm this, the ADF test and multiple regressions have been applied. The data, which are stationary in nature, are used to describe the variables considered for the study and to ascertain whether these are significant or not by applying the multiple regression technique. In the course of the study, only one variable, that is, crude oil has been found to be significant. The study discloses that the Indian stock market

exhibits a weak form of efficient market hypothesis. Hence, the investors cannot make abnormal profits by using historical information.

Limitations of the Study and Scope for Further Research

The study is undertaken for a limited time period. The study considers only five macroeconomic variables. More macroeconomic variables shall be selected to do further analysis. The monthly data of five macroeconomic variables and NSE Nifty 50 prices were selected from the secondary sources ; it may have certain limitations that are inherent in the collection sources. The results are obtained on the basis of the ADF test and multiple regression. Various other statistical techniques can also be used to conduct similar studies in the future.

Author's Contribution

Dr. R. P. Prakash undertook the empirical study and extracted research papers with high repute, filtered these based on keywords, and generated concepts and codes relevant to the study design. The author verified the analytical methods for the study. The numerical computations were done by him using E-VIEWS.

Conflict of Interest

The author certifies that he has no affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest in the subject matter, or materials discussed in this manuscript.

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