Macro-Economic Variables and Stock Market: are they Co-integrated? - A Study on NSE India

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Abstract
The stock market acts as a barometer for the economy. Stock Market Performance and Economic Growth go in hand in hand in the case of the Indian economy. While considering Indian economic growth, the stock market performance plays an essential role. The period of study ranges from 2000 to 2017. The tools used for the study are the ADF unit root test and Johansen co-integration test. The study concludes that Gross domestic product, FDI, Crude oil price, Inflation and Real interest rate have a significant relationship with the NSE stock market for the study period.
Keywords: ADF test, Co-integration, Economy, Macroeconomic variables, NSE

Introduction

The stock market does the job of collecting funds in capital markets. The intermediaries for the fund flow in the stock market are financial institutions like life insurance companies, mutual funds, pension funds and foreign institutional investors. Generally, the performance of the stock market is detected as a measuring instrument for the development of the Indian economy. The bullish market indicates the growth in the economy, whereas Bearish Market shows the decline in the economy. The stock market allocates capital to corporate sectors which will have an impact on real economic activity. When firm borrowings are more than the return on investment, then the economic growth will be declining. Thus, the stock market and economic growth are interrelated with one another. Organized and active stock markets can change the form of demand for money & thus supporting the development of the economy.

Review of Literature

Naka, et. al. (1998) analyzed relationships among selected macroeconomic variables and the Indian stock market. By employing a vector error correction model, the Analysis finds that three long-term equilibrium relationships exist among these variables. The results suggest that domestic inflation is the most severe deterrent to Indian stock market performance, and domestic output growth is its predominant driving force.

Pethe and Karnik (2000), using Indian data for April 1992 to December 1997, attempts to find how stock price indices are affected by and affect other crucial macroeconomic variables in India. The study, of course, avers that in the absence of co-integration, it is not legitimate to test for causality between a pair of variables. It does so given the importance of the relation between the state of the economy and stock markets.

Bhattacharya and Mukherjee (2002) investigated the nature of the causal relationship between the BSE Sensitive Index and the five macroeconomic aggregates in India (i.e., IIP, money supply, national income, interest rate and

inflation rate) using monthly data for the period 1992- 93 to 2000. Their major findings suggested no causal linkage between stock prices and money supply, national income and interest rate while IIP lead the stock price, and there was two-way causation between stock price and inflation rate.

Mishra (2004) by using monthly data for period 1992 to 2002, examined relationship between stock market and foreign exchange markets using Granger causality test & Vector Auto Regression technique study suggested that there is no Granger causality between exchange rate return & stock return.

Kaur (2009) In this research thesis, an attempt has been made to explore the causal relation between BSE SENSEX and some macro-economic variables by using correlation, descriptive statistics, unit root stationary tests and Granger causality. Annual data has been used from 1950 to 2006 for all the variables, like, SENSEX, per capita gross national product (GNP), forex reserves, gross domestic product (GDP), bank rate, wholesale price index (WPI), gross domestic capital formation, domestic savings, broad money. Econometric techniques like unit root tests have been done to check out the stationarity. Finally, Granger causality has been applied to study the causal relationship between them and results that have come out are mixed.

Chellasamy (2013) analyzed the effects on rupee depreciation against the dollar, covering the area of currency growth, foreign investment, and macro-economic factors that affected Indian currency during study period from 1989-1970 to 2012-2013.

Statement of the Problem

The study examines whether there is any statistically significant relationship between the key parameters of performance of NSE on economic growth. The stock market performance has a positive impact on economic development. There will be a dilemma existing among the investors and economists whether the stock market influences the economic growth or economic growth shows the impact on the stock market performance. Considering this dilemma, the study is being made to reflect the impact of NSE stock market performance on the Indian economic growth. This study is carried out from 2000 to 2017.

Objective of the Study

1. To find out the co-integration between macro-economic variables and the stock market.
2. To see whether any relationship exist between economic variables and the performance of the stock market.

Hypothesis of the Study

H0: There is no stationarity exists between macroeconomic variables and Stock Market.

H1: Co-integration exists between GDP and stock market performance.

H2: Co-integration exists between FDI and stock market performance.

H3: Co-integration exists between crude oil price and the stock market.

H4: Co-integration exists between inflation and stock market performance.

H5: Co-integration exists between the interest rate and the stock market.

Research Methodology

The sampling used for this study is the Purposive sampling method. The data are collected based on the purpose for the data to be collected and the data relevant for the study and the availability of the data. The data used for the study is secondary and it is yearly data and collected from the NSE website and World Bank indicators website. The study is done with yearly data from January 2000 to December 2017. The data is a time-series data that gives a clear picture of the economic development of the nation and impact of the stock market on the economic growth from the early period to the current period. To analyze the result, Descriptive Statistics is used to check the normality and ADF (Augmented Dickey Fuller) Unit Root Test to analyze the Stationarity. Johansen Co-integration test is being used to examine the relationship or Co-integration among the variables.

Data Analysis and Interpretation

A. Augmented Dickey - Fuller Test of Macroeconomic Variables and NSE

Augmented Dickey Fuller Unit root test is used to test the Stationarity among the series or the variables. It comprises Level, Fist Difference and

Second Difference as intercept and trend, intercepts and none.

H0: There is no stationarity exists between macroeconomic variables and Stock Market.

Variables	Level		First Difference	
	t-Statistics	*Probability	t-Statistics	*Probability
FDI	-2.496984	0.3268	-5.389742	0.0002*
GDP	-2.662749	0.2584	-3.186967	0.0324*
Crude Oil	-1.712703	0.7176	-5.353074	0.0002*
Inflation	-2.745349	0.2279	-7.104458	0.0000*
Interest Rate	-3.237879	0.0984	-7.507715	0.0000*

Source: Author's calculation; * Significant at 5% level

The result of the Augmented Dickey Fuller Test is shown in the above table Unit Root Test is used to ascertain the order of integration among the data. ADF test was applied at level, first difference and Second Difference with the assumptions such as Constant, Intercept and Trend. The null hypothesis of the Unit root was rejected in the Level and it shows that there is no stationarity found among the variables. Hence, the variables are tested at First difference to check the stationarity at first difference. The result implies that all the variables were not stationary when tested at level but they are stationary when tested with the first difference.

B. Co-integration between macro-economic variables and stock market

H1: Co-integration exists between GDP and stock market performance.

Johansen Co-Integration Rank Test (Trace) of GDP and NSE

Hypothesized No of CE	Eigen value	Trace Statistic	Critical Value	Prob
None	0.455282	15.49471	25.97733	0.0509
Atmost 1	0.350535	10.79017	3.841466	0.0010

Trace test indicates 2 co-integrating at the 0.05 level

Johansen Co-Integration Rank Test (Maximum Eigen Value) of GDP and NSE

Hypothesized No of CE	Eigen value	Max Eigen Stat	Critical Value	Prob
None	0.455282	14.26460	15.18717	0.1356
Atmost 1	0.350535	10.79017	3.841466	0.0010

Max-eigen value test indicates 2 co-integrating at the 0.05 level

The table indicates the Johansen Co-Integration Trace test which implies that the Critical Value is greater than the Trace Statistic Value. Hence, there is a long run association existing between the variables. The table reveals the maximum Eigen statistics in Johansen Co- Integration which shows that the probability value is greater than 0.05. Hence, the null hypothesis is rejected. This implies that there is a Co-Integration between the variables GDP and NSE.

H2: Co-integration exists between FDI and stock market performance.

Johansen Co-Integration Rank Test (Trace) of FDI and NSE

Hypothesized No of CE	Eigen value	Trace Statistic	Critical Value	Prob
None	0.418475	15.49471	20.52556	0.0580
Atmost 1	0.243400	6.973021	3.841466	0.0083

Trace test indicates 2 co-integrating at the 0.05 level

Johansen Co-Integration Rank Test (Maximum Eigen Value) of FDI and NSE

Hypothesized No of CE	Eigen value	Max Eigen Stat	Critical Value	Prob
None	0.418475	13.55254	14.26460	0.0645
Atmost 1	0.243400	6.973021	3.841466	0.0083

Max-eigen value test indicates co-integration at the 0.05 level

The table indicates the Johansen Co-Integration Trace test, which implies that the probability value is greater than 0.05 and the Trace Statistic value is greater than the Critical Value. Hence, the null hypothesis is accepted. Similarly, in maximum Eigen statistics in Johansen Co-Integration, the critical value is greater than the maximum Eigen value and the probability value is greater than 0.05. Hence, the null hypothesis is accepted. This implies that there is Co-Integration between the variables CNX Nifty and Foreign Direct Investment.

H3: Co-integration exists between crude oil price and the stock market.

Johansen Co-Integration Rank Test (Trace) of Crude Oil and NSE

Hypothesized No of CE	Eigen value	Trace Statistic	Critical Value	Prob
None	0.454946	15.49471	23.53943	0.0525
Atmost 1	0.284451	8.367646	3.841466	0.0038

Trace test indicates 2 co-integrating at the 0.05 level

Johansen Co-Integration Rank Test (Maximum Eigen Value) of Crude Oil and NSE

Hypothesized No of CE	Eigen value	Max Eigen Stat	Critical Value	Prob
None	0.454946	14.26460	15.17178	0.1258
Atmost 1	0.284451	8.367646	3.841466	0.0038

Max-eigen value test indicates 2 co-integrating at the 0.05 level

The table indicates the Johansen Co-Integration Trace test which shows that the probability value is lesser than 0.05 percent. Hence, the null hypothesis is accepted. The table indicates the maximum Eigen statistics in Johansen Co-Integration which shows that the critical value is greater than the maximum Eigenvalue. Hence, the null hypothesis is accepted. This implies that there is a Co-Integration between the variables Crude Oil Price and the stock market.

H4: Co-integration exists between inflation and stock market performance.

Johansen Co-Integration Rank Test (Trace) of Inflation and NSE

Hypothesized No of CE	Eigen value	Trace Statistic	Critical Value	Prob
None	0.593090	15.49471	31.46279	0.0501
Atmost 1	0.301869	8.983700	3.841466	0.0027

Trace test indicates 2 co-integrating at the 0.05 level

Johansen Co-Integration Rank Test (Maximum Eigen Value) of Inflation and NSE

Hypothesized Noof CE	Eigen value	Max Eigen Stat	Critical Value	Prob
None	0.593090	14.26460	22.47909	0.1020
Atmost 1	0.301869	8.983700	3.841466	0.0027

Max-eigen value test indicates 2 co-integrating at the 0.05 level

The table indicates the Johansen Co-Integration Trace test, which implies that probability value is lesser than 0.05 and null hypothesis is accepted. Table indicates maximum Eigen statistics in Johansen Co-Integration, which shows that the p-value is greater than 0.05. Hence, the null hypothesis is accepted. This implies that there is a Co-integration between variables Inflation and Stock market Inflation.

H5: Co-integration exists between the interest rate and stock market.

Johansen Co-Integration Rank Test (Trace) of Interest Rate and NSE

Hypothesized No of CE	Eigen value	Trace Statistic	Critical Value	Prob
None	0.491683	15.49471	27.30234	0.0505
Atmost 1	0.339952	10.38607	3.841466	0.0013

Trace test indicates 2 co-integrating at the 0.05 level

Johansen Co-Integration Rank Test (Maximum Eigen Value) of Interest Rate and NSE

Hypothesized No of CE	Eigen value	Max Eigen Stat	Critical Value	Prob
None	0.491683	14.26460	16.91627	0.0686
Atmost 1	0.339952	10.38607	3.841466	0.0013

Max-eigenvalue test indicates 2 co-integrating at the 0.05 level

The table indicates the Johansen Co-Integration Trace test, which implies that the critical value is greater than the trace statistic value. So there is the association in the long run. The table indicates the maximum Eigen statistics in Johansen Co-Integration, which shows that the critical value is greater than the maximum Eigen value. This implies that there is a Co-Integration between the variables of Real Interest Rate and the stock market.

Findings

From the analysis, it is found that macro-economic variables are associated with stock market performance. From the analysis, it is clear that all the macro-economic factors are liable in the price movement of stocks. Stock market performance is highly dependent on these macro factors. Any fluctuation or changes happening in these macro-economic factors directly have an impact on stock market performance. Gross Domestic Product, Foreign Direct Investment, Crude Oil Price, Inflation, Interest Rate; all are co-integrated with stock market performance.

Conclusion

Investors and investment is the essential object for the stock market performance. The study concludes that Gross domestic product, Foreign Direct Investment, Crude oil price, Inflation and Real interest rate have a significant relationship with the NSE stock market for the study period 2000 to 2017. Investors, policymakers and economists must make decisions regarding the regulations of the stock market and their impact on economic growth.

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