Impact of IIP & Inflation on S&P BSE 500 Listed Companies : An Analysis of Granger Causality

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Abstract

The objective of this study was to analyze the impact of macroeconomic variables on functioning of the Indian stock market. Financial markets play a very important role in the growth and development of an economy. Economy is affected by various macro and microeconomic variables. Recently, demonetization and the new indirect tax system, that is, GST have brought a lot of changes in the economy and have affected the functioning of the stock market. Various studies have shown this relationship by applying various financial models. In this study, monthly data of macroeconomic variables like inflation and index of industrial production on BSE 500 companies for the period from 2011–12 to 2017–18 were taken. The study used Augmented Dickey - Fuller (ADF) test for unit root test ; multiple regression and Granger causality test were also applied to find the results. Time series data must be stationary, otherwise the results are not useful. To make the data stationary, ADF was used. Multiple regression was used to find the significant variables and Granger causality was used to check the causality between the significant variables. The study found that both macroeconomic variables had a significant relationship with BSE 500 listed companies.

Keywords : **ADF, BSE500, Granger causality, macroeconomic variables, multiple regression, stock market**

JEL Classification Codes : C5, E6, O4

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The popularity of the Indian stock market is not hidden. We all know that it is a very important factor in the context of Indian economic growth. The financial factors indicate flourishing of any kind of economy and this can decide the fortune for good investment avenues. Many economists and researchers have proved that the capital market plays a very vital role in fostering capital formation and sustaining the growth of the economy. As far as macroeconomics is concerned, it is the analysis of the country's economy as a whole. With the help of this analysis, we can read cyclical movements of the economy such as unemployment rate, gross domestic product, interest rates, inflation, money supply, fiscal deficit, budget deficit, exchange rate, international trade, etc. According to many renowned studies, macroeconomic variables are the most remarkable variables for studying different conditions of the stock market. Researchers have focused on many kinds of relationships

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between macroeconomic variables and stock market movements. Through this relationship, the prevailing trends in the economy can be analyzed. In an emerging economy, the stock markets are likely to be very sensitive due to fundamental changes in the structure of macroeconomic variables and the relative policies which are very important to achieve financial stability. The stock market is observed very carefully by government bodies, investors, and companies. Therefore, researchers and economic policy makers always keep an eye on the behaviour of the capital market. It is a well - established theory in literature that it is a claim that the stock market is always affected by movements of macroeconomic variables. Some groups of studies seek to test international and local economic factors that influence stock market returns. Based on existing literature, it is concluded that the Indian stock market has developed in terms of different stock exchanges and different other intermediaries, number of different stocks, trading volume, investor population, turnover of the stock exchange, and price index. In the context of this condition, the Indian stock market has a critical question : Whether the development of the Indian stock market a decade ago is also affected by domestic and international macroeconomic variables ? Different studies have given many contradictory results, which are based on different methodologies. The answer to this critical question is still being searched by researchers worldwide due to gradual changes in macroeconomic variables. According to IMF (International Monetary Fund), the Indian economy is the seventh largest economy in the world in terms of liberalization and globalization, and in the context of purchasing power parity (PPP), it is the third largest country in the world. According to CIA (Central Intelligence Agency), India is also classified as a newly industrialized country. This decade is immediately following a global financial crisis from 1998 to 2008 which witnessed exponential increases in global capital movements, especially in emerging markets. The most favourable demographic characteristics, scope of diversification, growth potential, and economic policies also affect capital flows in India, which are shared among many emerging market economies.

Macroeconomic Variables

Two macroeconomic variables are used in the study : Inflation and index of industrial production. Basically, the meaning of inflation is a general rise in price of services and goods over a period of time. The purchasing power of money is reduced in this particular time due to reduction in annual inflation. When money supply increases in the market, it causes inflation as the expectation of return increases (Patel, 2012). High expectation for return reduces the value of a firm, and ultimately, the share price decreases. Price inflation is always measured by consumer price index (CPI) over a period of time. Some negative and positive effects can be considered due to gradually increasing rate of inflation. The main negative effect is that it decreases the value of money and may discourage investments and savings. It shows that inflation affects the stock market. For this reason, the relationship between inflation and stock market is studied.

IIP is an important indicator to measure the growth in the industry and economy. It includes major sectors like mining, manufacturing, power, etc. A positive relationship is expected between IIP and stock returns. The 2009 recession in the Indian economy affected production, and ultimately IIP performed very poorly and it also affected the stock market. The new RBI Governor, Shaktikanta Das also indicated that new growth in IIP would be considerable. The growth trajectory maintenance is also very important for the Indian economy.

↳ **S&P BSE 500 :** The Bombay Stock Exchange is the most popular stock index in the world, which was founded by Premchand Roychand. He was the man who made prosperity in the business of stock broking and is also known as Cotton King. The BSE is the oldest stock index in India as well as in Asia. BSE 500 is one of the famous indexes of the Bombay Stock Exchange. S&P BSE 500 is one of the free float market indexes. It has been designed to be a broad representative of the Indian industries. The major top 500 companies are listed on this index.

Literature Review

In the past, various researchers, financial analysts, economists, and practitioners tried to predict the relationship between macroeconomic variables and stock market movements. By using a combination of variables, different methodologies, and tests, various conclusions have been drawn. Here, we discuss the past research and their empirical conclusions related to the study. Expected and unexpected inflation negatively affected the stock market.

According to Sharma and Mahendru (2010), a relationship in the long run was analyzed between macroeconomic variables and Bombay Stock Exchange indices. Particularly, a change had been analyzed due to changes in gold prices, inflation rate, foreign exchange reserves, and exchange rates. The analysis was conducted with multiple regression model in order to investigate the long run relationship. Results showed a high correlation between exchange rate and gold prices. The influence of inflation and foreign exchange reserves was upto the limited extent. Adam and Tweneboah (2008), in the Ghana stock market, analyzed the effect of macroeconomic indicators on share prices by using Johansen's multivariate co-integration test. The research analyzed both short run and long run relationships between some macroeconomic variables like FDI, T Bill rate, CPI, and exchange rate. A co-integration was established between macroeconomic variables and stock prices. In the short run, exchange rate and inflation mattered for movements in the stock market, where inflation and interest rate varied significantly in the long run. Kandir (2008) used growth rate of industrial production index, change in CPI, growth rate of money supply, exchange rate, and change in international crude oil, interest rate, and return on the MSCI world index of equity. An investigation was conducted to check the effect of all these macroeconomic variables on the stock market returns in the Turkish stock market. Data were taken from all non-financial firms which were listed on the ISE. The study was based on stock portfolio instead of a single stock. The results showed that after applying the multiple regression model, macroeconomic variables affected almost all the stock prices. Pal and Mittal (2011) took quarterly time series data from January 1995 to December 2008 for checking the effect of macroeconomic variables on the Indian stock market. The variables which were considered for the study were exchange rate, inflation, and gross domestic savings of the Indian economy. Some econometric models like co-integration tests were applied to derive the long term and short term statistical dynamics. ECM showed that the inflation rate directly impacted BSE Sensex and CNX Nifty. Interest rate had a significant impact on Nifty and the exchange rate.

Ouma and Muriu (2014) used the APT model. This research investigated the impact of macroeconomic variables on stock market returns of the Kenya stock market. Arbitrage pricing model and capital asset pricing model were used on monthly data from 2003–2013. Two interesting results were obtained from this research. The first is that all variables were $I(0)$ and the second is that except interest rate, other variables had a significant relation with stock market returns. However, the exchange rate had a negative impact on stock market returns. According to Mugambi and Okech (2016), impact on bank stock was checked by using linear regression model in the Nairobi Stock Exchange. A few macroeconomic variables like interest rate, exchange rate, GDP, and inflation were considered for the analysis. The analysis period was from 2000–2015. Correlation analysis and unit root testing were employed for testing multicollinearity and stationarity among the variables. The empirical results showed that the exchange rate, interest rate, and inflation had a significant impact on bank stock returns. Liu and Zhang (2015) examined economic policy uncertainty (EPU) to stock market volatility. Higher EPU led to a significant increase in market volatility. Their findings showed that incorporated EPU was considered as an additional predictive variable to the existing prediction of volatility. Rossi and Sekhposyan (2015) measured uncertainty and proposed new indices. These indices measured how unexpected a realization of the macroeconomic variables was related to the unconditional forecast error distribution. The use of forecast error distribution was based on the forecast of the survey of professional forecasters. Tripathi, Singh, and Singh (2016) used new indices and these were compared with those which were proposed in the literature to check the impact of

macroeconomic variables. According to Ashwani and Sheera (2018), some specific macroeconomic variables such as T-bill rate, money supply, and exchange rate had predicted the capacity for stock market volatility. Kaur (2016) said that exchange rate had no relation with the change in the stocks of BSE 500 listed companies, and on this basis, the Indian stock market may be weak.

Ali, Rehman, Yilmaz, Khan, and Afzal (2010) found co-integration between IIP and stock market. Anbar and Alper (2011) found that applied research had been done over bank services in Turkey from the period from 2002–2010. Profitability of the banks was measured by ROA (return on asset) and return on equity (ROE). According to the results, the actual size of the credit policy and some loan policy produced a negative impact on bank profitability. By increasing bank size and income without interest, banks can improve their profitability. They used bank level data, and examined how the overall banking environment affected the profitability of domestic, commercial, and foreign banks which are operating in 15 countries from the period from 1995–2001. According to results, profitability of both foreign and domestic banks was affected not only by the banks' specific factors, but also by the structure of the financial market and macroeconomic conditions. All the variables were significant ; whereas, their impact and relation with profits were not always the same for both foreign and domestic banks.

Filis, Degiannakis, and Floros (2011) investigated the time varying correlation between oil prices and stock market prices for oil exporting and importing countries. An econometrical model DCC-GARCH-GJR approach was employed to test the hypothesis which was based on data from six countries. It showed that correlation did not differ for oil exports and imports. In response to aggregate demand side, the correlation increased positively. As a result, the oil market was not a safe heaven.

According to the above review, it is found that no research has been done with this combination of dependent and independent variables. According to recent developments, IIP is going to play a major role in the context of the economic growth of India. Inflation always plays an important role in the economic growth, so we have taken this type of combination for our study. The past researches were mostly based on overall indices which were listed on the stock markets of the countries. However, in our research, it is specific for only one index, that is, BSE 500. BSE 500 majorly consists of companies from different industries.

Research Objective

- To analyze the impact of macroeconomic variables like inflation and IIP on the functioning of S&P BSE 500 index.

Research Methodology

The objective of this study is to analyze the impact of a few macroeconomic variables on the functioning of stock returns in India. This study has considered BSE500 as proxy of the Indian stock market. Index of industrial production and inflation rate are taken as the macroeconomic variables. Time series data has been used for the analysis and time period from April 2012 to December 2018 has been taken. As we know for time series analysis, data must be stationary ; so, Augmented Dickey Fuller (ADF) test has been conducted for making the data stationary. Further, multiple regression test has been applied to check the significant variables, and Granger causality test has been used over significant variables to check the causal relationship between the variables. E-views 10 is used for the analysis.

Table 1 shows the variables, symbols used, and proxy for the variables. The below given model is used to indicate the effect of IIP and I on the stock market.

$$Sensex = f(IIP, I)$$

Table 1. Data Description and Symbols

Variables	Symbols	Proxy Used
Index of Industrial Production	*IIP*	General Index Numbers of Industrial Production
Inflation	*I*	Consumer Price Index
Stock Market	*BSE 500*	Closing Price of Sensex

Table 2 shows the descriptive statistics of variables used in the analysis. BSE is positively skewed, while IIP and I are negatively skewed. Kurtosis value of IIP shows the leptokurtic distribution and inflation in platykurtik distribution, while BSE shows normal distribution. JB test shows the normality of data, and the null hypothesis of the data is normally distributed. Probability value of the data shows that the null hypothesis is rejected in the case of IIP and I, while it fails to get rejected in case of BSE.

Table 3 shows the correlation between BSE, IIP, and I. Correlation among the variables is moderate, and no sign of multicollinearity is found. BSE and IIP have positive correlation, while inflation is negatively correlated with IIP and BSE.

Table 4 presents the unit root test results of the variables. ADF unit root test is applied to check the hypothesis whether the variable has a unit root. BSE500 and inflation series become stationary at first differencing, and IIP is stationary at level.

Table 2. Descriptive Statistics

	BSE	***IIP***	***I***
Skewness	0.107	-3.349	-0.661
Kurtosis	1.86	18.5	2.45
Jerque - Bera (JB)	4.532	965.165	6.928
Probability	0.103	0.000000	0.031

Table 3. Correlation

	BSE	***IIP***	***I***
BSE	1.000	0.443	-0.247
IIP	0.443	1.000	0.031
I	-.247	0.031	1.000

Table 4. Augmented Dickey - Fuller Unit Root Test

Variables	Level	I[st] Differencing	Null Hypothesis	Result
BSE 500	NS	-7.769 (0.000)	Rejected at first difference	Stationary at first difference
Index of Industrial Production (*IIP*)	-8.965 (0.000)	NR	Rejected at level	Stationary at level
Inflation (*I*)	NS	-6.067 (0.000)	Rejected at first difference	Stationary at first difference

Note. *NS = Non-significant, NR = Not required

Table 5. Multiple Regression Result

Variables	Coefficient	*t*-statistics	*p*-value	*R* Square
IIP	68.007	4.646	0.000*	26.49%
Inflation	-196.26	-2.697	0.008*	

Note. *Significant at 5%

Table 6. Granger Causality Test Results

Variables	Obs.	*F*-Statistics	*p*-value	Null Hypothesis	Result
BSE and *IIP*	78	0.237	0.789	BSE does not Granger cause IIP	No Relation
IIP and *BSE*	78	1.59	0.210	IIP does not Granger cause BSE	No Relation
BSE and *Inflation*	78	0.118	0.888	BSE does not Granger cause Inflation	No Relation
Inflation and *BSE*	78	0.634	0.533	Inflation does not Granger cause BSE	No Relation

Table 5 presents the results of multiple regression. Regression has been applied to know the significant macroeconomic variables of the stock market. For the analysis, it is found that both the variables are significantly affecting the stock prices. These results are found to be similar to the study results of Pal and Mittal (2011). *R* - square shows the variation in stock market explained by inflation and IIP. In the analysis, only 26.49% variation is explained by these two variables. There may be some other variables which are not included in this analysis.

Table 6 presents the results of Granger causality test. Clive W. Granger proposed a statistical approach to infer the cause and effect relationship between two or more time series, which is known as Granger causality. It is based on the logic that effect cannot precede the cause. Granger causality is used to determine whether one time series is useful in forecasting another. With the help of this test, the study analyzes the causal relationship between BSE500 and macroeconomic variables like inflation and IIP. Hypothesis related with this test is given in Table 3, and based on the results, the *p* - value has been estimated. The analysis shows that inflation and IIP do not Granger cause the BSE500. The *p* - value is more than 0.05 in case of inflation and IIP. It is clearly indicated that no causality relation is found between macroeconomic variables and BSE 500. The results show that no unidirectional or bi-directional relationship has been identified.

Conclusion

This research paper examines the impact of macroeconomic variables like inflation and index of industrial production on the performance of Indian stock market by using monthly data for the period from April 2012 - December 2018. Both the variables are important from an economic point of view. IIP measures the level of industrial activity in the economy, which also impacts the functioning of the stock market (Ali et al., 2010 ; Shanken & Weinstein, 2006). To examine the relationship, ADF, multiple regression, and Granger causality test were applied for the time period from April 2012 to December 2018. Regression results show that IIP and inflation significantly affect the stock market. A long run relationship exists between IIP & stock market, and inflation & stock market. The cause and effect relationship between dependent and independent variables is identified by the Granger causality test. This study does not provide evidence of causality between both the macroeconomic variables and the stock market.

Implications

This study has some implications from a policy point of view. Index of industrial production is an important factor

for economic and industrial growth. Policymakers must pay attention to support industry growth by making suitable policies for flourishment of industries. Inflation is also significantly affecting the stock market, so RBI must control it by changing the repo rate and reverse repo rate. This study uses IIP and inflation to measure its impact on the stock market. Further studies can be explored by including some other variables like economic growth, exchange rate, and crude oil prices to see their impact on stock market performance.

Limitations of the Study

This study is limited to the time period of 2011-12 to 2017-18 because of availability of data. The study was based on the analysis of secondary data which is already published, which may not be very reliable. The study is limited to only two important variables, IIP and inflation, which may not completely represent the macroeconomic variables.

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