IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

An empirical impact of GDP and Inflation on Indian Stock Market inclusive with Sensex

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Abstract:

This paper tends to convey the relationship between a macroeconomic variable and the Indian stock market. The stock market plays an important role in fulfilling the needs of investors by mobilizing funds and transforming them into an asset. For the economic health of any country, the Stock market is considered as the barometer. The various phases of the business and economic cycle are also reflected in the movement of a stock market index. Thus, the movement of macroeconomic factors plays an imperative role in influencing the movement of any stock market index. Among many macroeconomic factors, the movement of GDP as well as inflation plays a crucial role. The Gross Domestic Product reflects a consolidated report of the performance of the Indian economy. Stocks tend to be more volatile when inflation is elevated. Our study aims to test this relationship using the most recent data and advanced techniques in the context of India. The methodology used for the study is descriptive statistics, Pearson's correlation and multiple regression to find the relationship between the dependent and independent variables. Data over the period of 2008 to 2019 has been used for the study to find the relationship between BSE SENSEX and GDP along with Inflation. Statistical inferences are drawn from the data by means of significance tests and bidirectional causality is seen between the inflation rate and the stock market.

Index Terms: macroeconomic variable, Stock Market Index, GDP, BSE SENSEX, Pearson's correlation, inflation.

Introduction:

The economic environment is composed of the micro and macro level variables which may either be formed logically on economic fundamentals or by many subjective factors which are unpredictable and non-quantifiable. It is generally perceived that domestic economic variables play a seminal role in the overall performance of the stock market the Gross Domestic Product and the inflation rate. Over the past few decades, the interaction of share returns and macroeconomic variables has been a subject of interest among academicians and practitioners. The study of Tripathy (2011) confirms the presence of autocorrelation in the Indian stock market and macroeconomic variables. A stock market is a market that provides a framework for public companies to get their shares listed for the purpose of trading. Looking at it from the other side, current GDP can have a real and measurable impact on the stock market, although it isn't always consistent.

Strong GDP performance indicates a strong economy, which can embolden investors. More activity in the markets can lead to share price gains, which then raises the major indexes. If GDP falls, investors have less confidence in the economy which can slow their trading activity. The shape and structure of the market have undergone tremendous change in the recent past. The market has witnessed essential institutional changes resulting in radical and significant improvements in efficiency, transparency and safety. Trading in the Indian stock market proceeds on its two stock exchanges namely the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE). The BSE has been in existence since 1875 and here BSESENX had been taken into consideration. There is a comprehensive group of macroeconomic variables that influences the stock prices in the share market of any country. The other indicator taken into the light of this study is inflation which has a direct impact on the variation of the stock market.

The present paper shows a detailed study of yearly data from the year 2008 to 2018. It is divided into five sections. It starts with the introduction Section 2 provides a review of the selected literature on the causal relationship between stock market returns and selected macroeconomic variables. In Section 3 data and the methodology for testing the stationarity, the existence of correlation and regression analysis, and the direction of causality if any have been discussed. The results of the techniques applied and their interpretation are given in Section 4 of the paper. Finally, the conclusion of the paper is represented in Section 5.

Literature Review:

A vivid representation of the macroeconomic variables like GDP along with Inflation has an influencing impact on stock prices. The study concludes that macroeconomic variables i.e., GDP and inflation have a significant impact on predicting changes in stock prices. The selected macroeconomic variable using regression and correlation analysis and monthly time series data from January 1990 to December 2010. The study shows that a reduction in inflation along with increased RGDP has a positive impact on Stock Market as stated in a study done by (*Reddy, 2012)*

This study investigated the long-run relationship between Indian stock prices and selected macroeconomic variables using the data used in the study in monthly frequency and period of the study including from January 2011 to December 2012. It has been conducted with the Granger causality test to check the direction of causation existing among the variables, *Singh (2014)*

The following study documented that the direction of causality runs from financial development (stock market) to economic growth. This study undertakes a set of econometric tests for the analysis such as the Unit root test, Engle-Granger Cointegration method and Error Correction Model, *Paramati and Gupta (2011)*

A study that aims to know the nexus between macroeconomic factors and Indian stock market prices over the period of 1991-2017. The result shows that there is a positive relationship between the Sensex and macroeconomic factors except for avg. inflation and the unemployment rate as they show a negative relationship, conducted by *Garg and Karla (2018)*

There is no cointegration in the study of Nifty and other macroeconomic variables except the Wholesale Price Index (WPI). Also stated that there is a causal relationship between the Indian Stock Market and other macroeconomic variables, says the study by *Kumar (2011)*

Robert D Gay (2008), spotted light on the time-series relationship between stock market index prices and the macroeconomic variables of exchange rate and oil price for Brazil, Russia, India, and China (BRIC) using the Box-Jenkins ARIMA model. In this study, it was found that there is no significant relationship found between the present and past stock market prices of BRIC.

As per *Malarvizhi, K., Thenmozhi, M. J., & Jaya, M. (2010)*, the movement of macroeconomic factors plays an imperative role in influencing the movement of any stock market index. This paper employs quarterly data from June 2000 to March 2010 to study the relationship between the NIFTY Index and GDP and that there is a bidirectional causal relationship between GDP and NIFTY.

Objectives:

The objective of this study is to get the eyesight of how the BSE Sensex has been affected by the change in Gross domestic product and Inflation rate of the country.
To examine the relationship between GDP, Inflation and the SENSEX Index movement of BSE.
To analyze the causal relationship between the above three variables.

Hypothesis:

H0; There will not be a statistically significant impact of Gross Domestic Product on the Sensex.
H0; There will not be a statistically significant impact of Inflation on the Sensex.
H1; There will be a statistically significant impact of Gross Domestic Product on the Sensex.
H1; There will be a statistically significant impact of Inflation on the Sensex.

Research Methodology:

Secondary data is used to analyze the relationship between the Sensex and selected macroeconomic factors over the period of Dec 2008 to Dec 2019. Data was collected from the Reserve Bank of India, the World Bank, and the Bombay Stock Exchange. For the criterion variable BSESENX, data is taken from the BSE website taking into account the yearly closing values of the S&P BSE SENSEX.

The study is based on time-series data of yearly observations of the aforementioned variables from 2008 to 2019 and includes 12 observations. This period represents the post-subprime crisis period that besides having a global impact also negatively affected the Indian Economy and BSE Sensex Index. To remove outliers and to ensure the sanctity of the financial data, the sample is taken from 2008 to 2019. Books are referred to support the formation of certain conceptual definitions and depth of knowledge of the subject. Journals, Magazines and newspapers will be used to accumulate the latest information about the variable under study in the research. The time series analysis is utilized to analyze the long-term and causal relationship between the variables. The time series analysis like the correlation of variables, descriptive statistics and multiple regression is applied in the study.

Data Analysis:

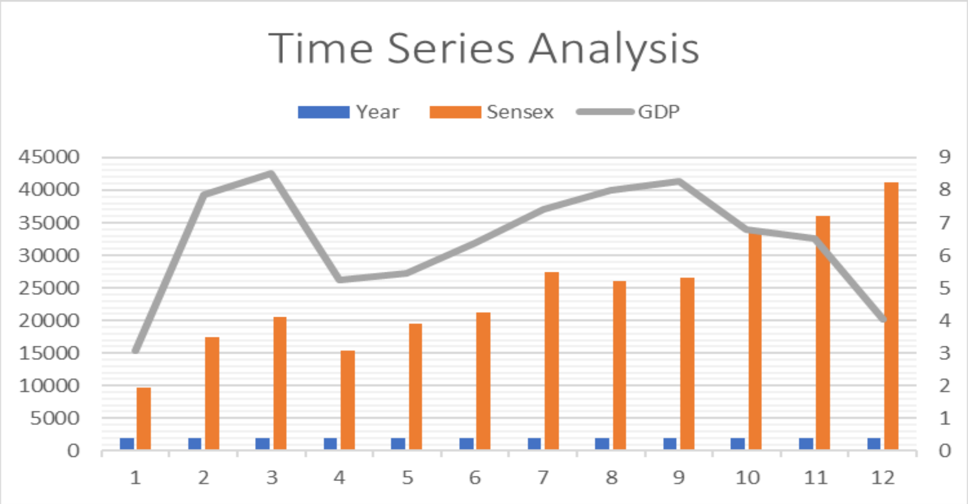
The Indian stock market is affected by various macroeconomic factors. It is necessary to analyze these particular factors. This study, it is tried to analyze how the different macroeconomic variables affect the Indian stock market indicator 'Sensex' and how it impacts the investors' decision and their investments. To analyze the relationship between Sensex as a dependent variable and all macroeconomic variables like GDP and Inflation as independent variables are selected.

Secondary data from the year 2008 to 2019:

Year	***GDP***	***Inflation***	***Sensex***
2008	3.09	8.35	9,647.31
2009	7.86	10.88	17,464.81
2010	8.5	11.99	20,509.09
2011	5.24	8.86	15,454.92
2012	5.46	9.31	19,426.71
2013	6.39	11.06	21,170.68
2014	7.41	6.65	27,499.42
2015	8	4.91	26,117.54
2016	8.26	4.95	26,626.46
2017	6.8	3.33	34,056.83
2018	6.53	3.95	36,068.33

Year	*GDP*	*Inflation*	*Sensex*
2019	4.04	3.72	41,253.74

Interpretation: The above table shows the raised growth in GDP rates from the year 2008 to 2010 but a slight downfall in 2011 which again rises till 2016 and again hits the downfall till 2019. The Inflation Rate is consistently increasing till 2013 and after it has been decreasing gradually till 2019. Sensex has been increasing consistently here.



A. Sensex and Gross Domestic Product:

Table 1. Correlation

	Sensex	*GDP*
Sensex	1	
GDP	0.121555317	1

Here, the above table clearly depicts the relationship between the Sensex and GDP. It is found that there exists a positive relationship between the Sensex and GDP rate, which means an increase in the GDP rate will also lead to an increase in the Sensex or the stock market. The relationship between the both is 0.121555317.

B. Sensex and Inflation:

Table 2. Correlation

	Sensex	*Inflation*
Sensex	1	
Inflation	-0.77097732	1

Here, the above table clearly depicts the relationship between Sensex and Inflation. It is found that there exists a negative relationship between the Sensex and inflation, which means an increase in the Inflation rate will lead to a decrease in the Sensex or the stock market. The relationship between the both is -0.77097732.

Regression Statistics

Table 3.

Multiple R	*R Square*	*Adjusted R Square*	*Standard Error*	*Observations*
0.79473538	0.631604324	0.549738619	6158.27553	12

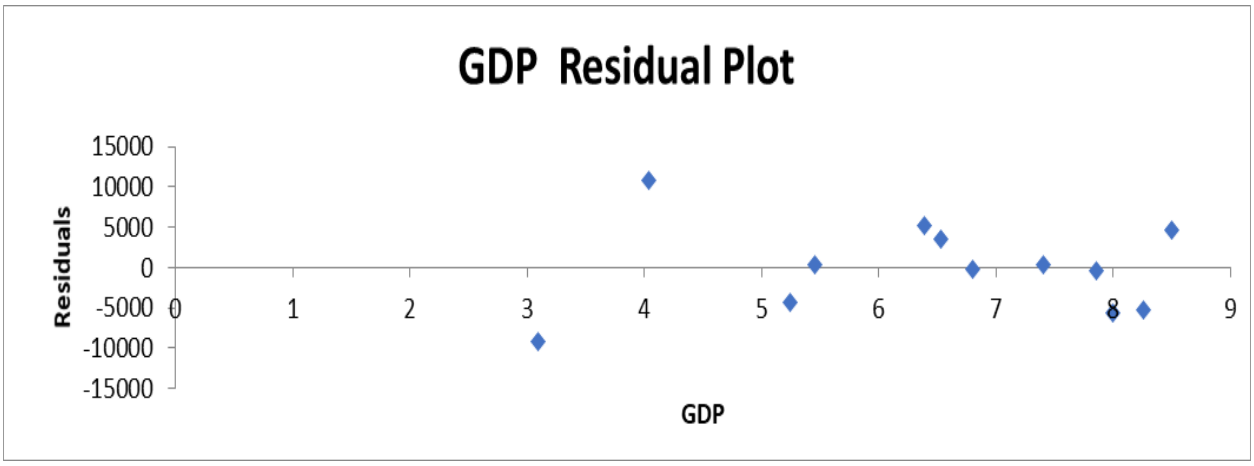
Table 4.

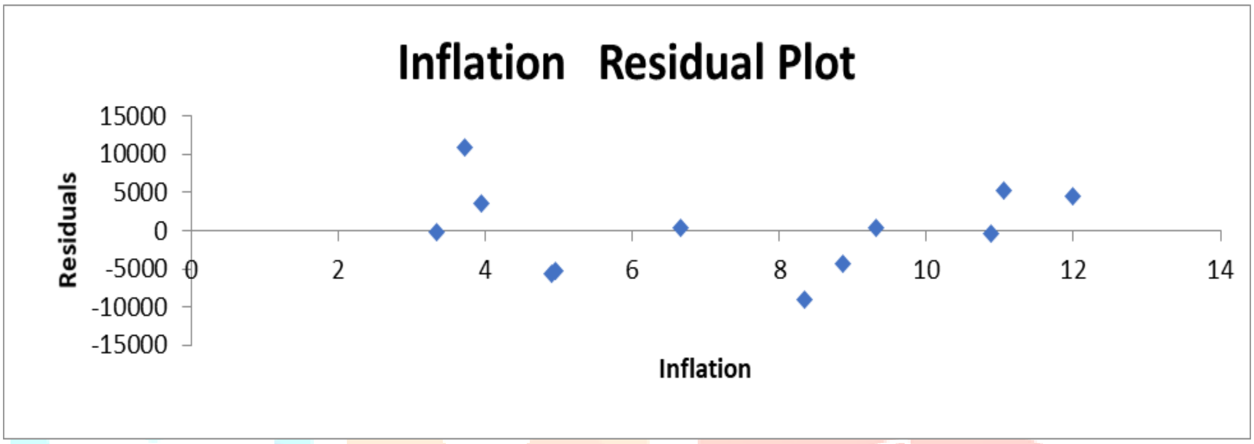
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	34853.27244	8113.738296	4.295587455	0.002003577
GDP	1034.706631	1085.404844	0.953290965	0.365342628
Inflation	-2310.322529	595.149892	-3.88191708	0.003720511

Table 5. Residual Output

Observation	*Predicted Sensex*	*Residuals*
1	18759.32281	-9112.012807
2	17849.75744	-384.9474375
3	15947.51167	4561.578326
4	19805.67757	-4350.757574
5	18993.66789	433.0421056
6	15912.88063	5257.799365
7	27156.80375	342.6162471
8	31787.24187	-5669.701866
9	31963.85269	-5337.392689
10	34195.90351	-139.0735055
11	32484.13275	3584.197253
12	30439.08742	10814.65258

Residual Plots





The above residual plots show the normality of the selective data by the plotting of numbers in a random horizontal line.

Findings:

- According to Table 1, the correlation between Sensex and GDP is positive, which means GDP affects movement in the Sensex. An increase in GDP certainly leads to an increase in the Sensex and vice versa.
- The relationship between the dependent variable i.e Sensex and the independent variable i.e inflation is negative. That shows negative movement in both variables. If there is an increase in the independent variable, the dependent variable behaves reversely.
- Multiple Regression analysis is used to test the hypothesis of the study and found out that the null hypothesis is rejected for Inflation and the GDP null hypothesis is accepted that show that there is a significant impact of Inflation on the Stock Market.
- With the context of Table 4, the P-value of GDP is 0.3653 and of Inflation is 0.0037. The normal range of accepting the H1 Hypothesis is less than 0.05.

Conclusions:

The study focused on analyzing the long-term dynamic relationship between the GDP and inflation with Sensex and the result shows very clearly there is a correlation between the Sensex and GDP along with Inflation. The test for the study period year 2008 to 2019 is performed as the next step. Multiple Regression analysis tests are used to test the hypothesis of the study and found that the null hypothesis is rejected for Inflation and the GDP null hypothesis is accepted showing that there is a significant impact of Inflation on the Stock Market. The result found that there is an inverse relationship between inflation and Sensex, i.e., a decrease in inflation will lead to an increase in the stock market. Government and policymakers should give importance to this inverse relationship while framing policies. The main contribution of the study is in identifying the role of economic growth in stock market development. Understanding the causal direction between economic growth and the stock market may assist investors in their estimates of the future movements of the stock markets. This is important for investors in making asset allocation decisions. This understanding is of significance for policymakers in developing policies to best suit economic objectives for the country. It can be concluded that all the macroeconomic factors taken for the study have a relationship with the Indian stock market and all the factors whether positively or negatively affect the movement along with the stock market prices. Conclusively, the government should implement policies that will reduce the inflation rate and poverty level through infrastructural development and improved standard of living. The stock market plays a significant role in mobilizing funds from surplus to deficient sectors of the economy. Besides this, it enables the pooling of funds from small investors to be utilized by productive sectors of the economy, which would not be otherwise possible and would remain idle. It also imparts liquidity to the financial system.

Limitations:

- Only two macroeconomic factors have been taken for the study.
- Only twelve years of data have been taken for the analysis.
- This study does not take into account a comparison between the impact of macroeconomic variables on the stock market indices across India.

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