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Descriptive statistical analysis of various relationships between Indian stock market and macroeconomic variables: An Indian perspective

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Abstract

The stock market, often called the "Barometer of Indian Economy," reflects the nation's economic performance. Various economic factors significantly impact its volatility. Researchers have identified FIIs as a crucial variable of microeconomics that affects the Indian stock market.

The trading practices of these traders can lead to excessive volatility, significantly impacting macroeconomic management. Macroeconomic factors like exchange rates, GDP, IIP, WPI, government expenditure (G), and oil prices are believed to affect stock market activity. Singh (2014) examined the impact of WPI, money supply, exchange rate, FII, IIP, interest rate, trade deficit, and gold price on the Bombay Stock Exchange (BSE) within the context of the interaction between macroeconomic parameters and the BSE.

Subject Classification: *91B64, 91G70.*

Keywords: *BSE, Macro economic variables, IIP, Regression model.*

1. Introduction

Many economic factors, have significant influence on stock market volatility. Aside from political volatility, a detailed examination of major economic indicators and their implications for stock markets indicated that the inflation, the credit/deposit ratio, broad money supply, and the budget deficit had the greatest impact on stock market fluctuations.

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FII has been identified by several researchers as most significant variables of microeconomics that occasionally impacts the Indian stock market.

2. Problem Statement

The researchers used statistical linear regression to analyze the Stimulation of Variables of microeconomic on the BSE Sensex. According to the study, growing GDP has a beneficial effect, and greater stock values arise from lower interest and inflation rates. Following are the results interpreted asper above Review of Literature , as shown in Table 1:

Table 1

Macroeconomic variable Results as per above Review of literature

Macroeconomic Variable Used in the Analysis Variable	Symbol	Results as per above Review of Literature
Gross Domestic Product	GDP	"Gross Domestic Product (GDP) will positively influence stock indices performances. If GDP is high then Stock price will be high.
Wholesale Price Index (Inflation)	WPI	Inflation Rate (IFR) will negatively influence stock indices performances. If IFR is high then stock price will be low.
Gold Prices	GP	Gold rate (GR) will negatively influence stock indices performances. If GR is high then stock price will be Low
Exchange rates (Rs./$)	ER	Exchange Rate (ER) will positively influence stock indices performances. If ER is high then Stock price will be high
Index of Industrial Production	IIP	IIP will positively influence stock indices performances. If IIP is high then stock price will be high"

3. Research Methodology

The current study is analytical in nature and relies on secondary data as per Table 2. Data have been collected from various websites such www.BSEindia.com, www.rbi.org.in , www.sebi.gov.in, www.tradingeconomics.com, www.indexmundi.com, www.bloomberg.cometc. Besides websites various annual reports from SEBI, NSDL/CSDL and RBI annual reports,

SEBI Handbook of Statistics, The Ministry of Statistics and Programme Implementation (MoSPI).The present study considers 5 years monthly data starting from 2016 to 2020. The current study is an attempt to investigate the impact of BSE (Sensex) on selected macro-economic variables in recent years by using statistical tools like Trend Analysis, Descriptive Statistics, and Linear Regression.

Table 2

Secondary Data (Macroeconomic Variables Used in the Analysis)

Macroeconomic Variable Used in the Analysis Variable	Symbol	Data Source	Unit of Measurement
Foreign Institutional Investors	FII	BSE/NSDL	Rupees Crore
Wholesale Price Index	WPI	http://dbie.rbi.org.in	Percentage
Gold Prices	G	http://dbie.rbi.org.in	Rupees per 10g
Index of Industrial Production	IIP	http://dbie.rbi.org.in	Percentage
BSE (SENSEX)	BSE	BSE/NSDL	Rupees Crore

4. Scope of the study

a) To examine the historical distribution and current trends of a few macroeconomic indicators in India.

b) The BSE measures the macroeconomic variables impact on the stock market of India (Sensex).

5. Macroeconomic Variables

In this study, a comprehensive empirical analysis has been conducted on selected macroeconomic variables as mentioned in Table 3 below:

Table 3

Name of Variables

Name of Variable	Sign.	Dependent or Independent
Bombay Stock Exchange (Sensex)	BSE (Sensex)	Dependent Variable
Foreign Institutional Investors	FII	Independent Variable
Inflation (Wholesales Price Index)	WPI	Independent Variable
Index of Industrial Production	IIP	Independent Variable
Gold Prices	G	Independent Variable

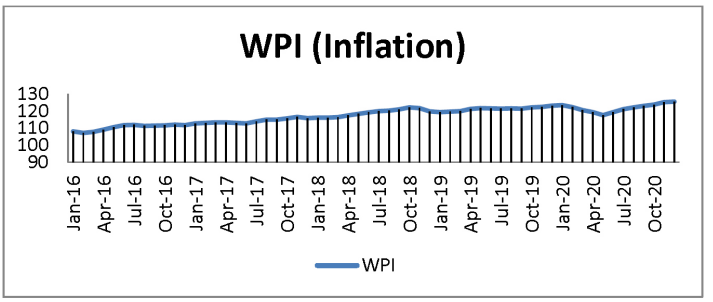


Figure 1

5-Year trend line for Wholesale Price Index Inflation

Empirical Data Analysis of Selected Macro Economic Variables:

1) Inflation: Inflation is a measure of the year-over-year change in the value of the Wholesale Price Index (WPI). Chandra (2004), have shown that inflation has a bidirectional impact on the corporate sector. Researchers have found a negative correlation between inflation and stock prices. The relationship between inflation and the stock market is not linear, but rather skewed. High inflation rates can have a detrimental effect on consumer savings and spending. The following graph in Figure 1, illustrates the monthly 5-year trend line for this selected macroeconomic variable.
2) IIP (Industrial Production Index): "Index of Industrial Production (IIP) holds significance as it serves as a gauge of tangible economic. A surge in the index is anticipated to propel stock prices higher In Figure 2. Below is the graphical representation showcasing the monthly trends of this crucial macro variable over a span of five years.

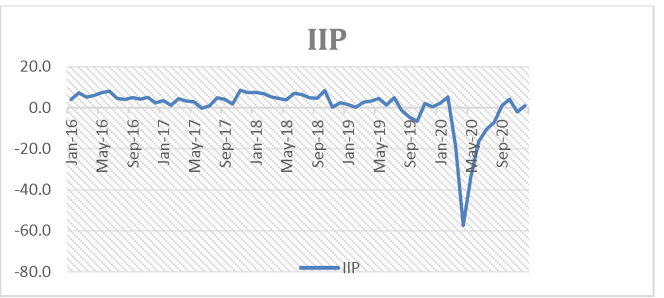


Figure 2

Index of industrial Production (IIP) -Source:https://dbie.rbi.org.in/

3) Gold Rate: A direct correlation exists between the price of gold and the performance of the stock market. The interplay between gold prices and stock market performance is vividly illustrated in the graph below. Here is the trend line depicting the monthly fluctuations of this significant macro variable over a period of five years as shown in Figure 3.

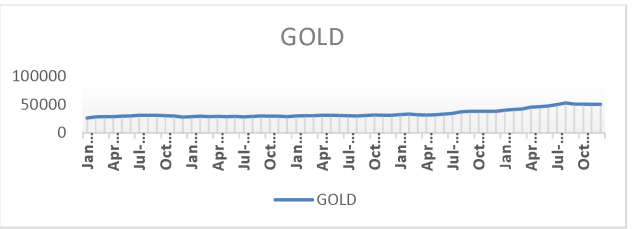


Figure 3

Gold (G) Source :https://dbie.rbi.org.in/

4) Foreign Institutional Investment (FII):

Insurance firms, pension funds, Hedge funds and mutual funds are examples of investors of institution. Mourya (2015) attempted to investigate the relationship between FII and the exchange rate. From 2009 to 2014, the study looked at daily data for these two characteristics throughout a five-year period. The above selected macro variable's monthly 5 year trend line is shown in Figure 4.

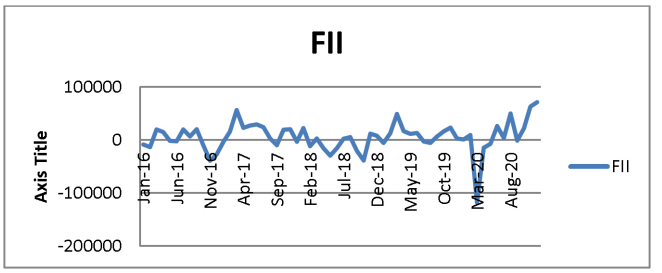


Figure 4

FII (Foreign Institutional Investors) Source:BSE/NSDL

5) BSE Sensex: "The S&P BSE SENSEX, commonly known as the BSE 30 or SENSEX, is a market-weighted stock market index that comprises 30 reputable and financially stable companies listed on the Bombay Stock Exchange. These 30 component companies, which are among the largest and most actively traded stocks, represent diverse

industrial sectors within the Indian economy. In Figure 5, below is the trend line showcasing the monthly fluctuations of the selected macro variable over a span of five years.

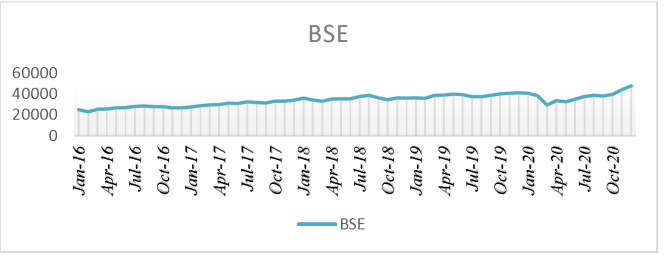


Figure 5

Bombay Stock Exchange Source: BSE/NSDL

7. Data Analysis

Descriptive statistics of BSE (Sensex) with selected macroeconomic variables

Table 4

Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
BSE	60	23002.00	47751.33	34003.17	5302.45032
FII	60	-118203	71046.00	5586.6833	27439.22011
WPI	60	107.10	125.40	117.2633	4.80198
IIP	60	-57.30	8.50	.7250	10.33808
GOLD	60	-57.30	8.50	.7250	10.33808
Valid N (Listwise)	60				

$*\sigma_s = \sqrt{1n-1} \sum ni=1(xi-\bar{x})2 \; *SE = \sigma/\sqrt{n}$

Table No. 4 presents the mean and standard deviation for various macro variables. The BSE (Sensex) exhibits a mean of 34003 and a relatively large standard deviation of 5302, indicating a high level of volatility in stock values. Conversely, the FII has a mean value of 5586 with a considerable standard deviation of 27439, suggesting that FII has a substantial impact on stock prices and a high degree of variability.

Inflation, as measured by the Wholesale Price Index (WPI), has a mean value of 117 and a relatively low standard deviation of 4.8, indicating a relatively stable inflation rate with limited variability. The Index of Industrial Production (IIP) has a mean value of 72 and a moderate

standard deviation of 10.3, signifying a moderate level of variability in industrial production.

As for gold, it exhibits a mean value of 34220 and a standard deviation of 7303, which is also quite high. This reflects significant variability in gold prices. Overall, the analysis reveals varying levels of variability in the different macro variables, with stock prices and gold prices exhibiting higher levels of volatility compared to inflation and industrial production.

5.1 *Impact Of BSE(Sensex) With Selected Macro Economic Model Variables:*

To fulfill the second objective of our study, which focuses on examining the impact of BSE (Sensex) on selected macroeconomic variables, BSE (Sensex) is considered the dependent variable, while the selected macroeconomic variables are regarded as independent variables. The statistical tool of regression analysis, conducted using SPSS, has been employed for this study. The Table 5 is the result/model summary generated from the SPSS analysis:

Table 5

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.976©	.952	.949	1200.842

ANNOVA[b]

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	1.6E+009	4	394882903.6	273.840	.000[a]
Residual	79311168	55	1442021.236		
Total	1.7E+009	59			

"*r = (n (∑xy)- (∑x)(∑y))/(√ [n ∑x2-(∑x)2][n ∑y2– (∑y)2)"

"*ANOVA(F) = MST/MSE, MST = SST/ p-1, MSE = SSE/N-p,
SSE = ∑ (n–1)"

- Above Table no-5 Model summary depicts that above data base analyse that R (correlation) stands as 0.976 that shows significant relationship between dependent variable BSE (Sensex) with other independent selected macro variables.
- R2 is a statistic that will give some information about the "goodness of fit of a model. In regression, the R2 "coefficient of determination"

is a statistical measure of how well the regression line approximates the real data points. An R2 of 1.0 indicates that the "regression line perfectly fits the data". The range of R2 is from 0to1. Above table interprets that rate coefficient of correlation is 0.95. It shows the very high positive correlation between dependent variable i.e.,BSE (Sensex) stock price and independent variables i.e., selected macro-economic variables". R2 also shows that 95% of above selected macroeconomic variables have a meaningful impact on the BSE stock price.

- Above ANOVA table i.e.,F(4, 16) =273, p =.000 depicts that our model is significant and it will a better predictor.

5.2 *Testing of Model Assumption:*

Table 6

Testing of Model Assumption

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-91170.8	4523.155		-20.156	.000
	FII	.049	.006	.253	8.059	.000
	WPI	1084.160	44.435	.982	24.399	.000
	IIP	18.604	19.273	.036	.965	.339
	GOLD	-.066	.035	-.090	-1.865	.068

Coefficient part of Regression model analyses that: Above Table no-6 interprets the impact of BSE (Sensex) as a dependent variable with other macro-economic variables. The results of the pre-determined assumption are analyzed as under in detail:

1) **BSE (Sensex) andFII:** (Null Assumption rejected) Thus BSE (Sensex) significantly impact FII (Foreign Institutional Investors).
2) **BSE (Sensex) and Inflation (WPI) (Null Assumption rejected** Thus BSE (Sensex) significantly impact WPI (Index of Industrial Production).
3) **BSE (Sensex) and IIP (Index of Industrial Production) (Null Assumption accepted):** Thus BSE (Sensex) doesn't significantly impact IIP (Index of Industrial Production).
4) **BSE (Sensex) and Gold (Null Assumption accepted):** Thus BSE (Sensex) doesn't significantly impact Gold.

5. Discussion and Conclusion

This study investigates the existing relationship between BSE (Sensex) and macroeconomic variables such as FII, IIP, WPI, G, which stands for investors of foreign institution, industrial production interest, inflation rates and price of gold, for the period monthly data of 5years". The results analysed that R (correlation) stands as .976 that shows significant relationship between dependent variable BSE (Sensex) with other independent selected macro variables. Thus, this result evidence that selected macroeconomic variables like IIP and Gold doesn't establish significant relationship with BSE (Sensex), while selected macroeconomic variables like FII and Inflation establish significant relationship with BSE (Sensex).

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