Zibaldone. Estudios Italianos - Vol. XII, issue 1 (2025)

ISSN: 2255-3576

ANALYSING THE IMPACT OF KEY MACRO VARIABLES ON S & P BSE SENSEX

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Abstract

Purpose – Numerous literature surveys explore the external factors influencing share prices across different markets. These studies analyze how various external variables impact company share prices, providing insights into market fluctuations. Researchers have often concentrated on specific factors affecting share prices. This study is significant as it investigates the impact of key macro economic variables and major Indian stock market index.

Design/methodology/approach – For analysis, three macro economic variables such as crude oil, gold price and exchange rate and S & P BSE Sensex were selected covering the study period from 01 January 2008 to 31 December 2023. The data collected for this study are month data of the variables. The tools used in this study are: (1) descriptive statistics, (2) normality test and (3) Granger Causality Test

Findings – The empirical findings of the study reveal that Gold Prices can be used to estimate the S&P BSE SENSEX index. Additionally, a bidirectional causal relationship was identified between the Exchange Rate and the S&P BSE SENSEX index, indicating mutual influence between these two variables.

Research limitations/implications – This study's findings present numerous opportunities for future research. A notable implication is the necessity for future scholars to investigate and clarify the inconsistencies observed in statistical results reported by different finance researchers.

Originality/Value – This study makes a modest effort to demonstrate the existence of a relationship between macroeconomic variables and the S&P BSE Sensex. However, understanding the country's current economic situation is crucial.

Keywords Crude oil, Gold price, Exchange rate, Normality test, Granger Causality Test, Indian stock market

Paper type Research paper

1. Introduction

With the rapid advancements in technology and a dynamic market environment, companies from various sectors have increasingly opted to list on stock exchanges. (Sarika Srivastava 2011). The dominance of national exchanges like BSE, which have expanded their presence nationwide, has rendered regional exchanges less significant, making their exit inevitable. While looking at the economic upsurge of a country it is foremost to examine the equity market which assists in capital formation and economic growth. In Indian market investors can have prolong success in the Indian market. There exists various macro-economic factors. Macroeconomics possibly a branch of economics that connected in structure and affects the market price of shares which will provide a parameter for long term investor. Crude oil supply is finite to certain level which cannot be raised further, the price of oil creates influence on global economic development. For the last fifty years instability in crude oil prices due to clash in the Middle East countries and political conflict in few oil-producing nations. Variations in oil prices used to forecast stock market returns globally. Crude oil is dominant input for production, the price of the oil is a depictive for economic activity. Oil importing countries like India, the crude oil price rise induce higher transportation cost along with production cost which have adverse effect on corporate earnings. (Alkhateeb et al., 2019., Seenu 2018), The decline in corporate earnings results in straight impact in the stock prices. With the exploration of oil in Assam during 1889,thereafter the Indian government perceive the value of oil and gas sector for economic growth. The Industrial Policy Resolution of 1954 (IPR), it is declared that oil and gas sector would be the crux sector industry.

Gold proceeds as operational hedge against the rise in prices. Gold is the dominant metal for investment and its price has an effect on the world currencies, which are being tradable goods for more than thousand years. Plethora Studies examines the effect of the exchange rate, gold price and crude oil price on the Indian stock market performance. (Muzaffar et al., 2020; Suresh et al., 2021)

Indian economy is highly influenced by fluctuating economic rates and an exchange rate exposes the value of nation's currency in terms of other currency. It plays a key role in trade and is extremely interrelated with income factors, specifically interest rates, inflation and capital gains from domestic securities. Market valuations of export industries are affected by the high volatile IND/USD exchange rates. Indian economy's one of the prime indicator is BSE Sensex.
(Bhuvaneshwari 2017; Lakshmanasamy 2021)

Several literature surveys can be seen in the areas of external factors that have an effect on the share prices for different markets. Examining and analysing the impact of various external variables on the share prices of the companies which assist in determining the fluctuations in the market. Many researchers have focussed on the certain factors which affects the share prices.

The present study is highlights the long run relationships between key variables and the major Indian stock market index. The volatility in key macroeconomic indicators such as Crude oil, Exchange rate and gold price has motivated the researcher to analyse the relationship between the

variables and BSE Sensex. Finally Bombay Stock Exchange (BSE) is selected for the study due to various reasons. First, BSE is the

Asia's oldest stock exchange which was established in 1875. Second, location of BSE as it is in Mumbai's Dalal Street which indicates the financial capital of India. In this paper, in the literature review, the relationship between the variables and its impact in the context of the Indian Stock market. **1.2 Literature Review**

Author	Objective	Key Findings
Misra(2018)	To investigate the link between BSE Sensex and macroeconomic variables over 1999-2017.	Found a long-run relationship between variables like IIP, inflation, and interest rates with BSE Sensex; short-run causality for inflation too.
Durai(2019)	To explore the nonlinear and time-varying relationships between stock prices and macroeconomic variables.	Identified nonlinear, timevarying cointegration using wavelet analysis, highlighting complexities in Indian stock markets.
Sathyanarayana et al. (2018)	To study the impact of crude oil price volatility on the Indian stock market, focusing on BSE Sensex.	Demonstrated that crude oil price changes significantly affect Sensex volatility, suggesting policy adjustments for economic stability.
Pakira(2014)	To analyze the relationships between the stock market, gold prices, and the exchange rate in India.	Found no causal relationship between the stock market and gold prices or the exchange rate, but identified a bidirectional relationship between gold prices and the exchange rate.
Pandey (2022)	To examine the influence of oil prices, gold prices, and the exchange rate on Indian sectoral indices.	Identified significant relationships between these variables and sectoral indices using multivariate cointegration and vector error correction models.

Alamgir and Amin (2021)	To explore the nonlinear relationship between oil prices and stock market performance in South Asia.	Found that rising oil prices positively and negatively affect stock performance, with oil price increases boosting stock prices in selected countries.

1.3Objective of the study

- The objective of the study is to examine the impact of three key macro economic variables namely Crude oil, Gold Price and Exchange rate on S& P BSE Sensex.
- To check the normality distribution

Hypotheses

- Null Hypothesis (H_0): There is no significant impact of Crude Oil Prices, Gold Prices and Exchange rates on the S&P BSE Sensex.
- Alternative Hypothesis (H1): Crude Oil Prices, Gold Prices and Exchange rates have a significant impact on the S&P BSE Sensex..

3. Method

3.1 Sample Selection

To analyse the impact of key macro economic variables on the Indian Stock market, S&P BSE Sensex was chosen. Among the various macro economic variables only key variables such as crude oil, gold prices and Exchange rates were selected. Convenient sampling method had been used in this study.

3.2 Data collection

The data collected for this study are closing prices of BSE Sensex and the monthly prices of macroeconomic variables. All the data have been collected from the official website of the BSE and RBI handbook. This study covering the study period from 01 January 2011 to 31 December 2023.

3.3 Tools used for the study

The tools used in this study are: (1) descriptive statistics (average monthly returns, maximum, minimum, standard deviation, skewness, kurtosis and Jarque–Bera Test), (2) Normality test (to check whether the data are distributed normally) and (3) Ganger Causality Test (cause-and-effect relationship was examined between selected macroeconomic variables and the Indian stock market index).The procedures and techniques used in this study are considered as per earlier research in the literature.

4. Results

4.1 Descriptive Statistics

First, we examined the descriptive statistics. Table 1 captures the results of descriptive statistics for BSE Sensex, Exchange Rate, Gold Price and Crude Oil.

Table 1 provides descriptive statistics for macroeconomic variables (Crude Oil, Exchange Rate, Gold Price) and the S&P BSE SENSEX index. The mean values are 76.869, 62.662, 90,882, and 31,064, respectively, representing the average levels of the series. The median values—74.629, 64.500, 84,446, and 27,290—highlight the central tendency. While the close proximity of mean and median values suggests some symmetry in the data, it does not confirm normality, warranting further testing.

The maximum values are 132.470, 83.357, 172,873, and 69,764, while the minimum values are 19.900, 39.280, 35,026, and 9,150 for Crude Oil, Exchange Rate, Gold Price, and S&P BSE SENSEX, respectively. This wide range indicates significant variability.

The standard deviations—25.113, 12.066, 33,879, and 15,421—reflect high dispersion around the mean, pointing to an uneven or heterogeneous distribution in the data. This variability emphasizes the need to account for risk and dispersion in the analysis of these variables.

TABLE 1 Descriptive Statistics of monthly Series from 2008 - 2023

	Mean	Median	Std. Dev.	Max.	Min.	N
Crude Oil	76.869	74.629	25.113	132.470	19.900	192
Exchange Rate	62.662	64.500	12.066	83.357	39.280	192
Gold Price	90882	84446	33879	172873	35026	192
S&P BSE SENSEX	31064	27290	15421	69764	9150	192

4.2 Normality of data

To assess the normality of the data series, we utilized the graphical analysis method suggested by Banda et al. (2019). This approach, one of the simplest for evaluating normality in time series, involves visually examining the evidence of mean and variance through normality plots. Figures 1 to 10 present the normality plots for four variables: Crude Oil, Exchange Rate, Gold Price, and S&P BSE SENSEX. The plots in Figures 1 to 4 reveal that none of these variables follow a normal distribution.

Figure 1

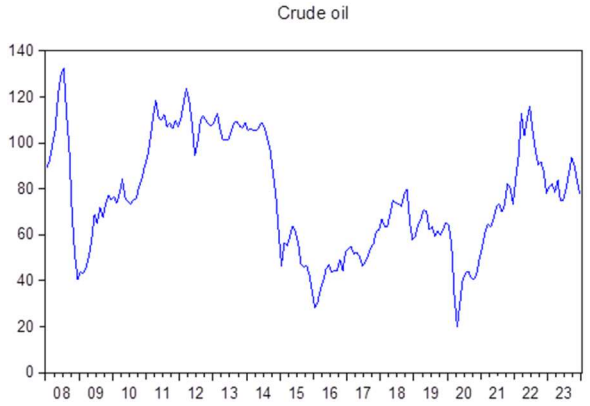


Figure 2

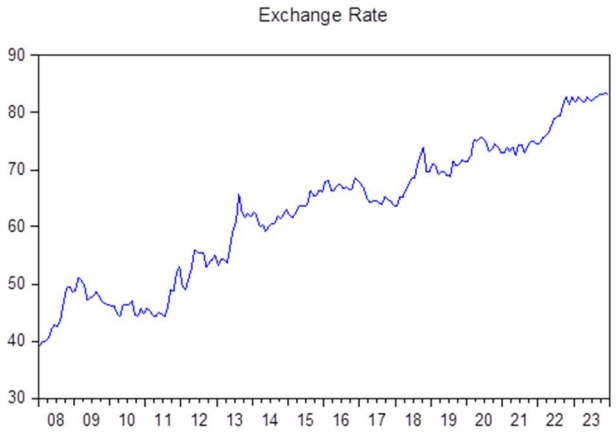
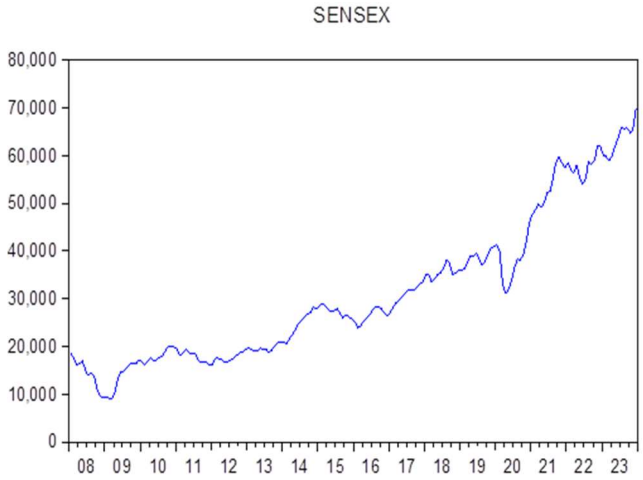


Figure 3

Figure 4



4.3 Granger Causality Test

A cause-and-effect relationship between selected macroeconomic variables and the Indian stock market index was analyzed using the Granger causality test. This test evaluates potential causal relationships between two variables, which can be either unidirectional or bidirectional. Before applying the test, the stationarity of variables was verified, and the appropriate lag length was determined, meeting all necessary conditions.

The following hypotheses were tested:

- **H_0:** Variable p is not caused by variable q, or vice versa.
- **H_1:** Variable p causes variable q, or vice versa.

The null hypothesis for each variable pair is outlined in the table, with inferences based on the p-value. If the p-value is less than 0.05, the null hypothesis is rejected, indicating causality. The Granger causality test was conducted on monthly data series for Crude Oil, Exchange Rate, Gold Price, IIP, and S&P BSE SENSEX, covering the period from 2008 to 2023.

TABLE 2 Granger Causality Test Results of Monthly series of Crude Oil, Exchange Rate, Gold Price and S&P BSE SENSEX

Null Hypotheses	**Obs.**	**F-Statistic**	**Prob.**	**Inference**	**Decision**
Crude Oil does not Granger Cause S&P BSE SENSEX	191	1.981	0.161	Accept	Independent
S&P BSE SENSEX does not Granger Cause Crude Oil	191	0.018	0.893	Accept	
Exchange Rate does not Granger Cause S&P BSE SENSEX	191	3.455	0.065*	Reject	Bidirectional
S&P BSE SENSEX does not Granger Cause Exchange Rate	191	6.043	0.015**	Reject	
Gold Price does not Granger Cause S&P BSE SENSEX	191	10.381	0.002***	Reject	Unidirectional
S&P BSE SENSEX does not Granger Cause Gold Price	191	2.606	0.108	Accept	

***,**,* denote significance at the 1%, 5% and 10% levels respectively.

Causality analysis was conducted at 1%, 5%, and 10% significance levels. The null hypothesis that one variable (e.g., Crude Oil) causes another variable (e.g., S&P BSE SENSEX index) would be rejected if the p-value exceeded 10%, indicating no causal relationship between the variables.

The analysis revealed that Crude Oil does not Granger-cause the S&P BSE SENSEX index. However, evidence of unidirectional Granger causality was found from Gold Prices to the S&P BSE SENSEX index, suggesting that Gold Prices can be used to estimate the S&P BSE SENSEX index. Additionally, a bidirectional causal relationship was identified between the Exchange Rate and the S&P BSE SENSEX index, indicating mutual influence between these two variables.

5. Findings

In accordance with the specific objectives of the study, the main findings are enlisted. It offers the findings related to the impact of crude oil, Exchange rate and gold price on Indian bench mark index S&P BSE SENSEX on monthly basis.

The descriptive analysis shows that the mean and median values cannot accurately represent all variables because they are too dispersed. However, the mean and median values are very close to each other, indicating that they represent the same data set. It indicates that the data is not normally distributed. In order to measure the volatility traditionally Standard deviation is used. Comparing the values of standard deviation, it is high during the study period.

The result of normality test of graphical analysis indicates that the normality plots for the four variables namely Crude Oil, Exchange Rate, Gold Price and S&P BSE SENSEX expose that none of the variables were normally distributed.

The analysis revealed that Crude Oil does not Granger-cause the S&P BSE SENSEX index. However, evidence of unidirectional Granger causality was found from Gold Prices to the S&P BSE SENSEX index, suggesting that Gold Prices can be used to estimate the S&P BSE SENSEX index. Additionally, a bidirectional causal relationship was identified between the Exchange Rate and the S&P BSE SENSEX index, indicating mutual influence between these two variables.

6.Conclusion

In this study we have presented the evidences on the impact of the key macro economic variables such as crude oil price, exchange rate and gold price on the major stock market index S & P BSE Sensex. In addition, the study gives the results that the Indian stock market index is extraneous in the sense that shocks to crude oil price or exchange rate explain Gold can be considered for estimating the S&P BSE
SENSEX index, and also found a bidirectional causal relationship between the exchange rate and the S&P BSE SENSEX index.

This study provides a proper understanding of the key macro economic variables in India. Further it reveals the theoretical hypotheses on the relationship and compares with empirical evidences from earlier research. This study anticipates offering some understanding for financial regulators in formulating economic and financial policies. The perception of this inter-relationship is also useful to shareholders as it provides a better understanding of the evaluation of variables evaluation to improve overall investment and performance. The possible extension in further research is to consider the impact of crude oil price, Gold Price and exchange rate along with other important macroeconomic determinants.

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