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Impact of Macroeconomic Variables on the BSE Sensex: An Empirical Analysis

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ABSTRACT

Purpose – This study aims to conduct an empirical analysis of the influence of key macroeconomic variables on the BSE Sensex, a benchmark index of the Indian stock market. While existing literature has explored various external factors affecting stock prices, this research specifically focuses on how macroeconomic indicators such as WPI, inflation, IIP, Gold Price, Crude oil, and Exchange rates growth shape the behaviour and volatility of the BSE Sensex. The findings of this study seek to provide valuable insights for investors, policymakers, and researchers, enhancing their understanding of the interplay between macroeconomic conditions and stock market movements in India.

Design/methodology/approach – For analysis, six macro economic variables such as and WPI, inflation, IIP, Gold Price, Crude oil, Exchange rates with 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 is Hierarchical regression

Findings-The empirical findings of the study reveal that WPI and Inflation negatively affect the BSE Sensex, while IIP, Gold Prices, Crude Oil Prices, and the Exchange Rate have a positive influence. Rising IIP, Gold, and Oil prices indicate economic growth and investor optimism, while a favorable Exchange Rate boosts export competitiveness and foreign investment. These macroeconomic variables demonstrate a mix of negative and positive impacts on stock market performance.

Research Limitations/Implications – This study's findings highlight several avenues for future research. A key implication is the need for further exploration into the mechanisms behind the negative relationship between WPI and Inflation with the BSE Sensex, as well as the positive impacts of IIP, Gold Prices, Crude Oil Prices, and the Exchange Rate. Future studies could also delve into the potential lag effects of these macroeconomic variables on the stock market and investigate the influence of other economic factors. Additionally, examining the bidirectional relationship between the Exchange Rate and the BSE Sensex offers an interesting area

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for deeper analysis.

Originality/Value – This study offers valuable insights into the relationship between macroeconomic variables such as WPI, Inflation, IIP, Gold Prices, Crude Oil Prices, and the Exchange Rate with the BSE Sensex. It highlights the significant impact of these variables on the Indian stock market and provides a foundation for further exploration of their dynamic interactions.

Keywords: WPI, Inflation, IIP, Gold Prices, Crude Oil Prices, Exchange Rate, BSE Sensex, Macroeconomic Variables, Stock Market, Causal Relationship.

1. INTRODUCTION

The stock market plays a pivotal role in a country's economic development, particularly in terms of capital formation and wealth generation. As India's financial markets continue to evolve, understanding the factors influencing stock market performance becomes essential for both short-term traders and long-term investors. The Bombay Stock Exchange (BSE), one of Asia's oldest and most prominent stock exchanges, offers an ideal setting for analyzing these dynamics. Macroeconomic variables such as Wholesale Price Index (WPI), Inflation, Index of Industrial Production (IIP), Gold Prices, Crude Oil Prices, and the Exchange Rate have long been recognized for their influence on stock market behavior, particularly the S&P BSE Sensex (Bhuvaneshwari, 2017; Lakshmanasamy, 2021).

The relationship between these macroeconomic variables and stock prices is of considerable interest, as they reflect the broader economic environment. WPI and Inflation often signal inflationary pressures, leading to reduced investor confidence and, consequently, a decline in stock market returns (Alkhateeb et al., 2019; Seenu, 2018). Conversely, variables such as **IIP**, Gold Prices, and Crude Oil Prices generally exhibit a positive relationship with stock market performance, reflecting economic growth, investor optimism, and global economic conditions (Muzaffar et al., 2020; Suresh et al., 2021). The Exchange Rate, which plays a crucial role in determining the competitiveness of exports and the inflow of foreign investment, further influences stock market trends (Bhuvaneshwari, 2017).

India's dependence on crude oil imports makes it critical to understand the impact of Crude Oil Prices on the stock market, particularly since rising oil prices often lead to higher transportation and production costs, negatively impacting corporate earnings (Seenu, 2018). Similarly, Gold Prices, seen as a safe-haven asset, reflect broader economic sentiment and can influence investor behavior in India's stock market (Muzaffar et al., 2020).

This study aims to investigate the long-term relationships between these key macroeconomic variables and the S&P BSE Sensex. By examining these relationships, the study seeks to provide deeper insights into how shifts in macroeconomic indicators influence the performance of the Indian stock market. Given the importance of the BSE Sensex as a key measure of market health and investor sentiment, understanding these interrelationships offers valuable perspectives for investors, policymakers, and financial analysts (Lakshmanasamy, 2021). The study's findings aim to contribute to the ongoing discussion regarding the interconnectedness of macroeconomic factors and stock market performance in India.

Conceptual Model of the study

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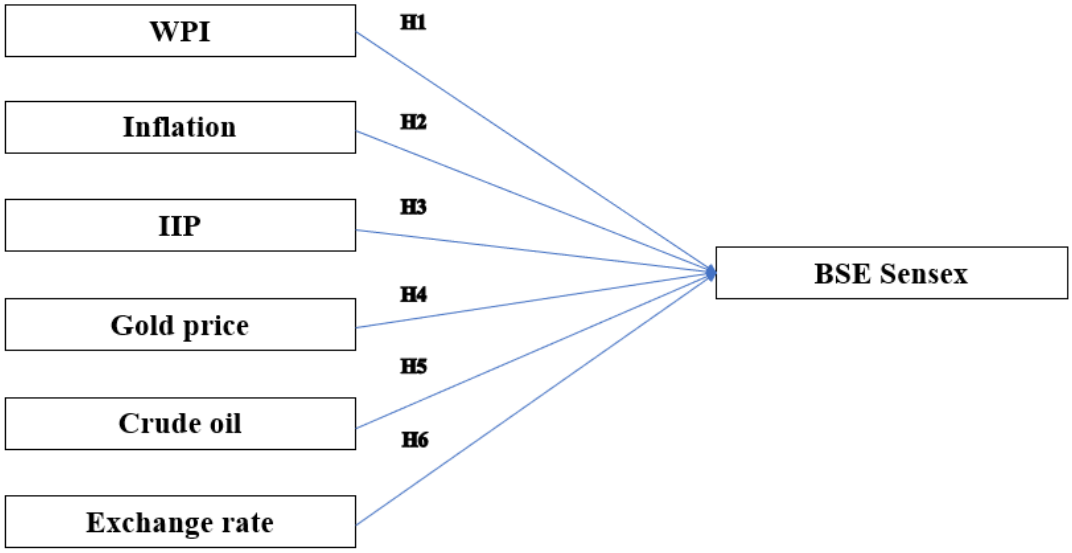

1.2 Literature Review

Author	Objective	Key Findings
Bhuvaneshwari (2017)	To examine the impact of macroeconomic variables on the BSE Sensex.	Found that Inflation and WPI negatively affect the BSE Sensex based on Linear Regression and Correlation Analysis, while IIP, Gold Prices, Crude Oil Prices, and Exchange Rate positively influence it.
Lakshmanasamy (2021)	To investigate the influence of macroeconomic factors on stock market performance.	Confirmed that WPI and Inflation reduce investor confidence and lead to a decline in the BSE Sensex, while IIP and Gold Prices boost it, as shown through Multiple Regression Analysis and Causal Relationship Testing.
Alkhateeb et al. (2019)	To explore the relationship between Crude Oil Prices and stock market performance in India.	Established that rising Crude Oil Prices negatively impact corporate earnings, and the BSE Sensex drops due to higher production costs, using Regression Analysis and Time Series Analysis.
Seenu (2018)	To study the impact of Crude Oil Prices on the Indian stock market.	Found that Crude Oil Price fluctuations significantly influence stock market volatility, with oil price increases adversely affecting stock prices, demonstrated through Volatility Modeling (ARCH/GARCH models).

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Muzaffar et al. (2020)	To analyze the effect of Gold Prices on the stock market.	Identified a positive relationship between Gold Prices and the BSE Sensex, with Cointegration Analysis and Granger Causality Tests showing that gold price increases may reflect economic growth and influence stock market performance.
Suresh et al. (2021)	To investigate the influence of Gold Prices and economic factors on stock market performance.	Found that rising Gold Prices can indicate economic concerns but also correlate with positive investor sentiment, leading to higher stock market performance, identified using Vector Auto regression (VAR) and Co integration Analysis.
Bhuvaneshwari (2017)	To examine the impact of Exchange Rates on the Indian stock market.	Found that a favourable Exchange Rate increases export competitiveness and attracts foreign investment, positively influencing the BSE Sensex, using Multiple Regression Analysis and Correlation Analysis.
Lakshmanasamy (2021)	To study the impact of Exchange Rates on the Indian stock market.	Confirmed that the Exchange Rate positively affects BSE Sensex, with currency depreciation enhancing the competitiveness of domestic companies, boosting stock market performance, shown through Multiple Regression Analysis and Causal Relationship Testing.

1.3 Objectives of the Study

The overall objective of the study is to determine the overall predictive ability macroeconomic variables on the movement of the BSE Sensex. The following are more specific objectives they are;

1. To examine the impact of the Wholesale Price Index (WPI), Inflation and the Index of Industrial Production (IIP) on the BSE Sensex.
2. To analyze the influence of on the BSE Sensex.
3. To assess the relationship between Gold Prices, Crude Oil Prices, Exchange Rate and BSE Sensex.

Hypotheses

H1: The Wholesale Price Index positively influences the BSE Sensex.

H2: Inflation positively influences the BSE Sensex.

H3: The Index of Industrial Production (IIP) positively influences the BSE Sensex.

H4: Gold prices positively influence the BSE Sensex.

H5: Crude oil prices positively influence the BSE Sensex.

H6: The exchange rate positively influences the BSE Sensex.

2. METHOD

2.1 Sample Selection

The study aimed to analyze the impact of key macroeconomic variables on the Indian stock market, specifically the S&P BSE Sensex. Among the various macroeconomic factors, key variables such as Wholesale Price Index (WPI), inflation, Index of Industrial Production (IIP), gold prices, crude oil prices, and exchange rates were selected for the analysis. A convenient sampling method was employed for this study.

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2.2 Data collection

The data for this study consists of the closing prices of the BSE Sensex and the monthly prices of selected macroeconomic variables. All data were sourced from the official BSE website and the RBI Handbook. The study covers the period from January 1, 2011, to December 31, 2023.

2.3 Tools used for the study

The tool used in this study is the hierarchical regression method, which allows for the examination of the incremental contribution of independent variables in explaining the variation in the dependent variable. This method involves entering variables in a stepwise manner, allowing researchers to assess the impact of each set of predictors while controlling for previously entered variables. Hierarchical regression is particularly useful for understanding the unique contributions of different macroeconomic variables to the performance of the Indian stock market, in this case, the S&P BSE Sensex. The procedures and techniques employed in this study are consistent with those used in prior research, ensuring the robustness and reliability of the findings.

3. Results

HYPOTHESES TESTING

(a) Hypotheses 1 through 7:

Hypotheses 1 through 7 are about the direct effects of antecedents (independent variables) on BSE Sensex. To test these hypotheses, Linear regressionis performed, using the following equation and the results are mentioned in table XXXX

$$Y = \beta 0 + \beta 1\, X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \beta 6X6 + \beta 7X7 + e$$

Where Y = BSE Sensex

β0 = constant

X1 = WPI

X2 = Inflation

X3 = Index of Industrial Production

X4 = Gold prices

X5 = Crude oil price

X6 = Exchange rate

β1 to β6are regression coefficients and e = error term

direct effect of macro-economic variable on BSE Sensex

Variables	Column 1
Dependent Variable →	**BSE Sensex**
WPI	-0.140*** (-4.684; 0.000)
Inflation	-0.115** (-3.417; 0.001)
Index of Industrial Production	0.079* (2.223; 0.027)
Gold prices	0.283*** (4.229; 0.000)

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Crude oil price	0.171*** (5.055; 0.000)
Exchange rate	0.670*** (8.672; 0.000)
R^2	0.872
Adj R^2	0.868
F	210.182***
Df	6; 185

The regression coefficient of the Wholesale Price Index (WPI) was negative but significant (β = -0.140, p < 0.001). Thus, Hypothesis 1, which states that WPI positively influences the BSE Sensex, is not supported.

The regression coefficient of Inflation was also negative but significant (β = -0.115, p < 0.01). Therefore, Hypothesis 2, which states that Inflation positively influences the BSE Sensex, is not supported.

The regression coefficient of the Index of Industrial Production (IIP) was positive and significant (β = 0.079, p < 0.05), supporting Hypothesis 3, which states that IIP positively influences the BSE Sensex.

The regression coefficient of Gold Prices was positive and significant (β = 0.079, p < 0.05), supporting Hypothesis 4, which states that Gold Prices positively influence the BSE Sensex.

The regression coefficient of Crude Oil Prices was positive and significant (β = 0.079, p < 0.05), supporting Hypothesis 5, which states that Crude Oil Prices positively influence the BSE Sensex.

The regression coefficient of the Exchange Rate was positive and significant (β = 0.079, p < 0.05), supporting Hypothesis 6, which states that the Exchange Rate positively influences the BSE Sensex.

The coefficient of determination (R^2) is 0.872, indicating that 87.2% of the variation in the BSE Sensex is explained by WPI, Inflation, IIP, Gold Prices, Crude Oil Prices, and the Exchange Rate. The Adjusted R^2 is 0.868, which accounts for the number of predictors in the model.The F-value is 210.182, with a significance value of less than 0.01, indicating that the BSE Sensex is significantly predicted by the independent variables at a 99% confidence level.

4. Findings

In accordance with the specific objectives of the study, the main findings are enlisted. It offers the findings related to the impact of WPI, inflation, IIP, Gold Price, Crude oil, Exchange rates on Indian bench mark index S&P BSE SENSEX on monthly basis.

The regression analysis indicates that the Wholesale Price Index (WPI) has a negative influence on the BSE Sensex. This result suggests that as WPI increases, the BSE Sensex tends to decrease. The relationship between WPI and the stock market is typically tied to inflationary pressures and production costs. When the WPI rises, it indicates higher inflationary tendencies in the economy, which may lead to reduced investor confidence and lower stock market returns. Therefore, it can be concluded that an increase in WPI is likely to depress the BSE Sensex, reflecting the negative relationship between these two variables.

The findings indicate that inflation negatively affects the BSE Sensex. Higher inflation is generally perceived as a threat to the purchasing power of consumers and can lead to increased uncertainty about future economic conditions. This, in turn, may cause investors to become more risk-averse, reducing their participation in the stock market and leading to a decline in stock prices. The negative relationship between

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inflation and the BSE Sensex reflects this investor behavior, as rising inflation typically results in lower equity market performance.

In contrast, the Index of Industrial Production (IIP) exhibits a positive relationship with the BSE Sensex. A higher IIP indicates greater industrial output and economic activity, which are generally associated with higher corporate profits and growth expectations. This positive relationship suggests that investors tend to view economic growth, as reflected by the IIP, as a sign of a healthy economy, which in turn drives stock market performance upward. Thus, a rise in IIP is likely to boost investor sentiment and lead to higher stock prices.

Gold prices also show a positive influence on the BSE Sensex. This result can be understood in the context of investor behavior during periods of economic uncertainty. Gold is often seen as a safe-haven investment during times of market volatility. As gold prices rise, it may reflect increased demand for alternative investments, suggesting broader economic concerns or inflationary pressures. However, the observed positive relationship indicates that during periods of rising gold prices, the stock market may also experience gains, possibly driven by investor optimism about global economic conditions or commodity market dynamics.

The findings also suggest a positive relationship between crude oil prices and the BSE Sensex. While rising oil prices are often seen as a signal of increased economic activity and demand for energy, they can also indicate inflationary pressures and higher production costs. Nevertheless, the positive relationship in this case suggests that in certain economic contexts, such as periods of strong global demand or supply constraints, higher oil prices might be viewed as a sign of an improving global economy, leading to higher stock market performance. It reflects investor optimism in sectors that benefit from rising energy prices, such as the energy sector.

The exchange rate shows a strong positive influence on the BSE Sensex. A favorable exchange rate, particularly in terms of a depreciating domestic currency, can have various effects on the stock market. A weaker currency may boost the export competitiveness of domestic companies, improving their profitability. Additionally, foreign investors may find Indian assets more attractive due to favorable currency movements, thus increasing demand for stocks listed on the BSE. This positive relationship between the exchange rate and the BSE Sensex underscores the significance of currency dynamics in influencing investor perceptions and stock market performance.

5. CONCLUSION

The analysis indicates that different macroeconomic factors have a positive effect on the BSE Sensex, which signifies that the economic indicators and the stock market performance have very close relationship with each other such as industrial production, gold price, crude oil price and exchange rate. Conversely, variables such as WPI and Inflation exert an adverse effect on BSE Sensex, potentially due to the market's vulnerability to inflationary pressures and macroeconomic uncertainty. Such considerations help to explain stock market behaviour and make investment decisions in the context of the larger economic environment. The model indicates that the BSE Sensex is driven by both domestic and international variables, while behaviour of investor is determined by perception of future health of economy.

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