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RESEARCH ARTICLE

Impact of Selected Macroeconomic Variables on BSE Sensex

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ABSTRACT

The stock market offers investors the chance to take part in the process of creating wealth and distribute capital effectively across various economic sectors, making it a crucial engine of economic growth and development. Macroeconomic variables hold significant value as indicators for investors and policymakers alike. Stock market indicators offer valuable perspectives into investor attitude and projections on the future trajectory of the economy. Macroeconomic factors, on the other hand, impact investment choices and the formulation of public policy by providing a more comprehensive picture of the state and stability of the economy. This study is an attempt to find the impact of selected macroeconomic variables on BSE Sensex. Monthly data from June 2022 to March 2024 of the variables BSE Sensex, GDP, Gold Price, Inflation rate, Unemployment Rate and Exchange rate was used in this study to find the impact of selected variables on BSE Sensex. In order to determine whether a unit root problem existed or not, the gathered data was analysed by ADF. In order to verify co-integration, the independent and dependent variables have been examined using the Johansen co-integration method. The Granger causality test has been used to quantify the causal link between the components.

INTRODUCTION

The performance of the stock market has a big influence on a nation's economic development. An efficient capital market drives economic growth and stabilizes the financial sector. In a well-functioning capital market, stock prices adjust swiftly to reflect available new information. All of the stock information that is currently accessible as well as predictions about the future performance of corporate entities are reflected in the stock prices. Consequently, if stock prices accurately reflect these presumptions, they ought to be regarded as a major indicator of economic activity. As a result, the dynamic relationship between stock prices and macroeconomic variables is of academic interest and has policy consequences.

The study of impact of macroeconomic issues on the stock market is one of the most important areas in finance. The main objective of this research, is to examine the causal links for the period of June 2022 to March 2024 between the stock market and the selected macroeconomic aggregates.The macroeconomic variables Gross Domestic Production (GDP), Gold Price (Gold), Inflation (INFL), Unemployment (UNEMP) and Exchange Rate (XR) were analysed for the study.

Many academics and economists have already examined the effects of various macroeconomic and financial factors on stock returns. The research makes it clear that different regions of the world have varied financial market behaviors, which accounts for the variation in empirical study results. Numerous academics have asserted that the stock prices are influenced by economic and financial variables that serve as indicators of

a nation's overall economic health because stock markets are thought to be the best indicator of that health. Investors believed that stock values could be predicted using basic macroeconomic factors like interest rates, inflation rates, and exchange rates.

Gross Domestic Product: The GDP is a broad indicator of the total economic activity of a country. In general, a growing GDP suggests a robust and rising economy. During times of economic expansion, businesses typically perform better, which increases corporate profits.
A growing GDP can give investors more confidence, which encourages them to make more stock market investments.

Gold: One asset seen as a "safe haven" is gold. In an effort to protect their investment, investors frequently purchase gold during uncertain economic times or volatile markets. Stock markets and gold prices have historically frequently shown a negative relationship. This is because gold's price rises during market downturns as investors look to it for safety. The sentiment of investors is important. Stock markets may rise due to positive mood over corporate earnings and economic growth, which would lessen the appeal of gold. As investors sought a safe haven during the 2008 financial crisis, gold prices spiked and stock markets fell.

Inflation: The rate of inflation, inflation expectations for the future, and central bank policies are only a few of the variables that affect inflation's complex effects on the stock market. While excessive inflation can be harmful to stocks by reducing purchasing power, tightening profit margins, and raising interest rates, moderate inflation can be good for equities by indicating economic growth. A thorough examination of market dynamics and economic conditions is necessary to comprehend the connection between inflation and the stock market.

Unemployment: There is a complicated relationship between unemployment and the stock market that is impacted by a number of variables, such as central bank policy, business investment, and consumer spending. Elevated jobless rates generally indicate economic fragility and may result in diminished profits for companies and a decline in stock values. On the other hand, low unemployment is a sign of a strong economy and can raise stock prices and investor confidence. But policymakers' reactions—especially those of central banks—are vital in moderating this relationship and have a big influence on market results. Investors can make better decisions in a variety of economic environments by having a better understanding of these dynamics.

Exchange Rate: A combination of direct effects on business earnings and competitiveness and indirect effects through economic development, investor mood, and monetary policy determine the relationship between exchange rates and the stock market. Investment professionals, decision-makers in government, and corporate executives must comprehend the dynamics behind currency changes as they have a substantial impact on stock market performance. When making investment decisions, investors need to take exchange rate trends into account as well as any prospective effects they may have on certain industries or companies

REVIEW OF LITERATURE:

Baranidharan, S., & Dhivya, N. (2020)[1], examined how BSE stock returns were impacted by the regime of macroeconomic factors, including the Production Index, IFT, FII, and M3. They came to the conclusion that, throughout the study period, risk was more closely associated with high returns than with partial normal distribution of the macroeconomic variables they had chosen. The BSE Sensex returns were not substantially influenced by the short-run relationships between the examined series during the study period or the selected macroeconomic factors.

Jain, T., & Singh, S. P. (2020)[2], have conducted the study and come to the conclusions using Regression Analysis and Correlation. Their analysis showed that the Indian stock market is influenced by the macroeconomic variables IIP and exchange rate. Exchange rate has a negative and comparatively little impact on Sensex, but IIP has a positive and substantial impact.

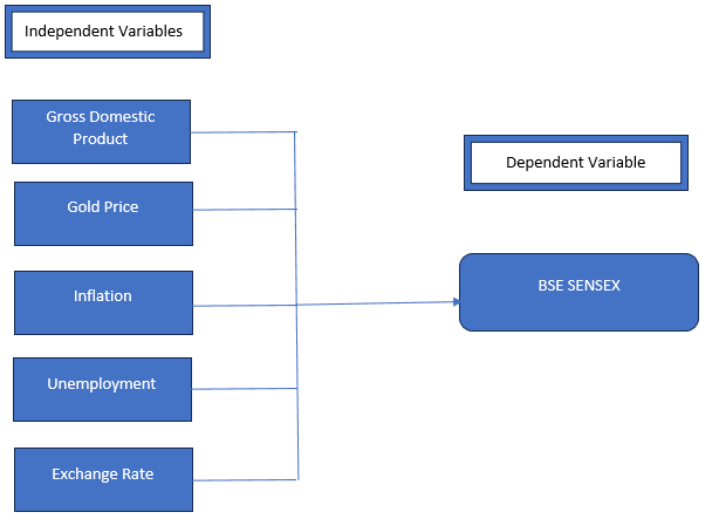
Nitin Kumar Agarwal & Dr. Swastika Tripathi (2020)[3], investigated the causal relationship between the BSE Sensex, a proxy for the Indian stock market, and several macroeconomic parameters. The results of the studies showed that the foreign exchange rate, foreign exchange reserve, money supply, and BSE Sensex did not cointegrate over the long run.

Anuradha Saha, Dr. Ayan Majumdar & Dr. Somnath Chatterjee (2020)[4], examined the relationships between the performance of the nine major macroeconomic variables that were chosen, including the Sensex's wholesale price index, gold price, crude oil, foreign exchange rate, foreign direct investment, foreign institutional investment, cash reserve ratio, and interest rates on Treasury bills. A long-term relationship between the variables and Sensex is demonstrated by the cointegration. Two macroeconomic factors that have long-term influence and move in opposing directions are the Wholesale Price Index and the Cash Reserve Ratio.Only three of the chosen macroeconomic variables taken into consideration for the investigation had a short-term impact on stock values, according to the results of the multivariate analysis. In order to correct the disturbances and return the long-run equilibrium in the desired direction, the crude oil price, foreign exchange rate, and call money rate adjust.

Bhupender Kumar Som & Himanshu Goel (2020)[5], examined how important macroeconomic variables related to the Bombay Stock Exchange (BSE) Sensex through the use of RStudio's regression modeling technique. The model's findings show that while the index of industrial production and foreign exchange are not significant, the long-term interest rate, consumer price index, and Morgan Stanley Capital International are. 93% of the variation in the dependent variable can be explained by the chosen independent variables, according to the r-square value.

Dr. M. Jegadeeshwaran & M. Basuvaraj (2020)[6], examined how macroeconomic variables affected the performance of the Indian stock market. The study's sample macroeconomic variables include the gross domestic product, interest rate, inflation, exchange rate, foreign direct investment, and unemployment rate. Multiple regression analysis and correlation were used in the data analysis. They came to the conclusion that stock market performance is highly influenced by macroeconomic factors.

CONCEPTUAL FRAMEWORK:



METHODOLOGY:

This study is a quantitative study which utilizes the empirical data to find the relationship and impact of selected macro-economic variables on BSE Index. Secondary data is used to analyze the relationship of the selected macroeconomic variables on BSE Sensex. The data was collected from RBI website, World bank website, and BSE website for the period June 2022 to March 2024. Descriptive statistics, correlation, test of stationarity – Augmented Dickey-Fuller test (ADF), Granger casualty test and Ordinary Least squares have

been used to analyze the impact of GDP, Gold Price, Inflation rate, Unemployment Rate and Exchange rate on SENSEX.

RESULTS AND DISCUSSION:

Descriptive Statistics

Descriptive statistics are shown in Table 1. The statistical values of the sample variables were calculated. Descriptive statistics provide historical context for the behaviour of sample variables' data, such as GDP, Gold, Inflation, Unemployment, Exchange Rate and Sensex used in the study. In this section, normality of data distribution is analysed. Based on the table, we could say that mean for GDP is high 81%. Standard deviation of the Sensex is high 36% and low for unemployment 2.6%. It is significant to note from Table 1 most of the sample variables earned values of Kurtosis larger than three and values of Jarque-Bera were also greater than three. It is clear that the sample variables are normally distributed.

Table 1: Descriptive Statistics

	GDP	GOLD	INFL	SENSEX	UNEMP	XR
Mean	0.810073	4.229075	0.760215	4.234546	0.746096	1.687938
Std. Dev.	0.130891	0.344200	0.175887	0.361066	0.026741	0.219941
Skewness	-1.176556	-0.396116	0.390432	-0.523598	3.091671	-3.109301
Kurtosis	3.197393	1.774241	1.799446	2.532092	12.72080	13.44116
Jarque-Bera	4.879088	1.863852	1.794694	1.151113	116.1367	129.2278
Observations	21	21	21	21	21	21

Unit Root Test

H_0: Unit root exist

H_1: Unit root does not exist

The first stage was to look at the stationary property of sample variables time series data, choose the best econometric approach and avoid getting false findings. The use of non-stationary variables could lead to misleading inferences. The presence of unit roots for all the sample variables in the mean equation was tested by applying ADF test. It is to be noted that the stationary level was analysed at 1%, 5% and 10% level of significance. The variables GDP, Inflation and Exchange Rate are stationary at level indicates a p-value of less than the significance level (usually 0.05), then the null hypothesis of a unit root is rejected, and the variable is considered stationary. This implies that the variable has no long-term trend, and the fluctuations around the mean are not persistent. The variable Sensex become stationary at first difference and the variables Gold and Unemployment become stationary at second difference. Hence, the null hypothesis, namely, there is no stationary among the variables GDP, Gold, Inflation, Sensex, Unemployment and Exchange Rate in India, was rejected during the study period.

Table 2: Stationarity Test

Variable	At level		First difference		Second difference	
	t-statistic	Prob.	t-statistic	Prob.	t-statistic	Prob.
GDP	-4.499	0.0023				
GOLD	-1.04532	0.7145	-2.51773	0.1271	-4.05507	0.0067
INFL	-4.86177	0.0017				
SENSEX	-1.4319	0.5461	-4.56801	0.0024		
UNEMP	-1.71462	0.4084	0.079973	0.9551	-3.67855	0.0143
XR	-4.47655	0.0024				

Correlation

The table of correlation matrix explains the correlation between dependent variable and independent variables. High collinearity of independent variables is not acceptable. If high correlations are found among variables, such variables are exempted and each one of those is considered as an individual factor. The table below shows that there is no multicollinearity between Sensex and other economic variables. The correlation between Sensex and Gold is high 0.93 and Sensex and inflation is 0.18 which is low among other independent variables.

If the correlation coefficient is positive, it suggests that there is a direct relationship between the macroeconomic variable and the stock market performance. In other words, an increase in the value of the macroeconomic variable is associated with an increase in the stock market performance, and vice versa. If the correlation coefficient is negative, it suggests that there is an inverse relationship between the two variables.

However, it is important to note that correlation does not necessarily imply causation. A significant correlation between two variables does not necessarily mean that one variable causes the other. Instead, there could be other factors that affect both variables, and thus, the correlation could be spurious.

Table 3: Correlation

	GDP	GOLD	INFL	SENSEX	UNEMP	XR
GDP	1.000000					
GOLD	0.113971	1.000000				
INFL	0.030874	0.285324	1.000000			
SENSEX	0.310419	0.931938	0.182676	1.000000		
UNEMP	0.254290	0.164611	0.053391	0.236600	1.000000	
XR	-0.146271	0.177376	-0.013479	0.195755	0.231292	1.000000

Pairwise Granger Causality Test

H_0: Sensex does not Granger cause macroeconomic variables

H_1: Sensex does Granger cause macroeconomic variables

Table 4: Granger Causality Test

Null Hypothesis	F-Statistic	Prob.		Result
SENSEX does not Granger Cause GDP	0.43674	0.6546		Accept H0
GDP does not Granger Cause SENSEX	1.4553	0.2666		Accept H0
SENSEX does not Granger Cause GOLD	3.33168	0.0455		Reject H0
GOLD does not Granger Cause SENSEX	0.02854	0.9719		Accept H0
SENSEX does not Granger Cause INFL	0.06126	0.9408		Accept H0
INFL does not Granger Cause SENSEX	1.41777	0.275		Accept H0
UNEMP does not Granger Cause SENSEX	0.85987	0.4444		Accept H0
SENSEX does not Granger Cause UNEMP	1.26414	0.3128		Accept H0
XR does not Granger Cause SENSEX	0.2102	0.8129		Accept H0
SENSEX does not Granger Cause XR	3.95467	0.0435		Reject H0

The Granger causality test indicates that Sensex does not Granger Cause Gold and Sensex does not Granger cause XR is rejected, but all the other null hypotheses or not. This indicates Sensex can be used to forecast Gold and Exchange rate. If the p-value is less than the significance level (usually 0.05), then the null hypothesis of no Granger causality is rejected, and it can be concluded that there is evidence of Granger

causality between the variables. In other words, one variable can be used to predict the other variable. If the p-value is greater than the significance level, then the null hypothesis cannot be rejected, and it can be concluded that there is no evidence of Granger causality between the variables. This means that the variables are not causally related, and one variable cannot be used to predict the other variable.

The correlation and Granger causality need to further verify for long term movements among Sensex and economic variables by the cointegration test.

Cointegration

H_0: There is no cointegration between Sensex and Macroeconomic variables

H_1: There is cointegration between Sensex and Macroeconomic variables

Johansen's cointegration test results depend on the trace statistic and the maximum eigenvalue statistic obtained from the test. The trace statistic tests the null hypothesis of r cointegrating vectors against the alternative of r+1 cointegrating vectors, where r is the rank of the cointegrating matrix. The maximum eigenvalue statistic tests the null hypothesis of r cointegrating vectors against the alternative of r+1 cointegrating vectors.

Table 5: Cointegration

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.989841	230.9078	95.75366	0.0000
At most 1 *	0.967213	143.7095	69.81889	0.0000
At most 2 *	0.819984	78.77262	47.85613	0.0000
At most 3 *	0.697417	46.19317	29.79707	0.0003
At most 4 *	0.576751	23.48055	15.49471	0.0025
At most 5 *	0.313415	7.144473	3.841466	0.0075
Trace test indicates 6 cointegrating eqn(s) at the 0.05 level				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.989841	87.19826	40.07757	0.0000
At most 1 *	0.967213	64.93687	33.87687	0.0000
At most 2 *	0.819984	32.57944	27.58434	0.0105
At most 3 *	0.697417	22.71262	21.13162	0.0297
At most 4 *	0.576751	16.33608	14.26460	0.0232

At most 5 *	0.313415	7.144473	3.841466	0.0075
Max-eigenvalue test indicates 6 cointegrating eqn(s) at the 0.05 level				

In Johansen's Cointegration approach, trace statistics and maximum Eigen statistics shows the presence of 6 cointegration equation at 0.05 level. This result indicates that there is long run relationship exists between Sensex and macro-economic variables.

Ordinary Least Square

H_0: There is no significant relationship between Sensex and Macroeconomic variables

H_1: There is significant relationship between Sensex and Macroeconomic variables

Ordinary Least Squares (OLS) regression to analyse the impact of macroeconomic variables on stock market performance, the interpretation of the results depends on several key components, including the coefficient estimates, the statistical significance of the coefficients, and the goodness of fit of the regression model.

A positive coefficient estimate indicates that the independent variable has a positive effect on stock market performance, while a negative coefficient estimate indicates that the independent variable has a negative effect on stock market performance. A coefficient with a p-value less than 0.05 is considered statistically significant.

Table 5: Ordinary Least Square

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.568743	0.753941	-0.754361	0.4623
GDP	0.581656	0.211525	2.749821	0.0149
GOLD	0.963626	0.081227	11.86330	0.0000
INFL	-0.177370	0.154455	-1.148362	0.2688
UNEMP	0.312802	1.050793	0.297682	0.7700
XR	0.093795	0.126433	0.741851	0.4696

The above table shows the result of ordinary least square method. The variables Gold and GDP has significant relationship with Sensex. The p value of Gold and GDP is less than 0.05. The variables Inflation, unemployment and Exchange rate are not having significant relationship with dependent variable Sensex. Hence, we accept the null hypothesis, there is no significant relationship between Sensex and macro-economic variables viz. Inflation, unemployment and Exchange rate for the selected period.

CONCLUSION:

The empirical finding demonstrates the normal distribution of the variables. Significant correlations between Sensex and several variables, particularly Gold, can be found by correlation analysis. According to the Granger causality test, Sensex can be used to predict the price of gold and the exchange rate. The long-

term association between the Sensex and the chosen macroeconomic indicators is confirmed by the Johansen's integration. The least squares approach indicates that there is a substantial correlation between the GDP and Sensex. For the chosen time, there is no significant link between the dependent variable Sensex and the variables inflation, unemployment, and exchange rate.

The study's findings shed insight on the connection between the BSE SENSEX and the chosen macroeconomic factors. Still, there is room for more study in this area. The primary focus of this study is the relationship between the macroeconomic factors and SENSEX, which has implications for other areas of the Indian economy as well.

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