

## Ups And Downs in Stock Behavior: An Analytical Approach

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### Abstract

In this research, we look at how changes in macroeconomic factors affect stock market performance. GDP growth rate, unemployment rate, US Dollar return, inflation rate, debt to GDP ratio, and manufacturing to GDP ratio are the six macroeconomic variables utilised as independent variables, and their annual data is analysed. The Sensex's performance after investment is the dependent variable. The ARDL model is used to examine the connection between the regressed and independent variables. A long-term correlation between the two variables has been confirmed using the Bound test. The developed model is fit, which is verified by the Serial Correlation LM test and CUSUM test.

**Keywords:** Indian Stock Market, Macroeconomic variables, GDP, Inflation, Unemployment

### Introduction

Many global macroeconomic factors affect the direction of stock values on the Indian stock exchange. Stock prices, market indexes, and investor sentiment may all be affected in the short- and long-term by the aforementioned factors. The Indian stock market is highly complex to a number of macroeconomic factors, including: Rates of Interest: The RBI's interest rate decisions have a major consequence on the Indian stock market. When interest rates are low, it's easier for businesses to raise money since borrowing money costs less. This may cause investors to put more money into the market, which might boost share prices. But if interest rates go up, borrowing money would cost more, which might slow the economy and have an undesirable influence on stock values.

Rates of Inflation: The rate of inflation is yet another major issue that may make or break the stock market. Low to moderate inflation is seen as beneficial to economic growth. However, rising inflation may undermine the buying power of consumers and damage company profits. Inflation rates are closely watched by investors as a proxy for economic and stock market volatility. Average Annualised GDP Growth: Stock market success is highly correlated with the nation's economic growth as restrained by the Gross Domestic Product (GDP). Stock prices tend to rise when the economy is doing well because companies are able to generate more profit. However, poor economic development or a recession may have a detrimental consequence on business profits and the stock market.

Rates of Exchange: The stock market in India is delicate to variations in the rupee/dollar exchange rate. Profitability of businesses involved in international commerce may be affected by variations in the price of the Indian rupee comparative to other major currencies. Lower rupee might be beneficial for export-focused corporations while posing difficulties for import-reliant enterprises. Reforms and Policies in the Government: Government policy and reforms have the potential to have a major result on the stock market. Regulatory shifts, tax code revisions, and other pro-growth policies all have the potential to affect investor sentiment and market behaviour.

In India's stock market, investor mood is heavily influenced by the global economic climate. Capital movements in and out of the Indian market may be triggered by events like financial crises, geopolitical conflicts, or shifts in global trade patterns. Profitability in Business: Earnings reports provide a window into a company's financial health, which is a key factor influencing stock prices. Profits growth in the positive tends to entice investors, while declines in profits might trigger sell-offs.

Money Flow and Direct Investment Abroad: Stock market liquidity, which is affected by things like trading volumes and participation, may have an effect on prices. The actions of Foreign Institutional Investors (FIIs) are important because they may affect the direction of the Indian stock market. It's vital to remember that the stock market is sensitive to a wide variety of factors in addition to the interaction between macroeconomic indicators. Stock prices are also heavily prejudiced by investors' and traders' mood, prospects, and perspectives. As a consequence, the stock market's response to macroeconomic factors may

## Review of Literature

Many academics and professionals in the field of industry have tried in recent years to inspect the connection between stock market volatility and macroeconomic issues in India. When looking at the data, India isn't far behind either. Consecutively a regression using six macroeconomic factors as regressor and Sensex as a dependent variable (Kanahalli and Ravindra, 2017) demonstrates that macroeconomic variables affect the Sensex. However, Gurloveleen and Bhatia (2015) discovered the link amongst designated industrial enterprises and macroeconomic parameters. They discovered that the association between exchange rate and FII in selected industrial stocks was quite substantial. Singapore's composite stock index and the indexes on behalf of the Finance and Property segments, as well as the Hotel Index, were subjected to correlation tests. Vector Error Correction Model (VECM) using a maximum likelihood estimate approach was used in their research. They came to the conclusion that interest rates, output values, inflation rates, money supply, and exchange rates were all significantly correlated with index returns and the Equities Property Index. However, the money supply and interest rates are two of the few factors that exhibit correlations with the hotel index and the banking sector.

The correlation between the Sensex and macroeconomic factors has been the subject of a small number of previous research. Using multiple regression approaches, Venkatraja (2014) found that explanatory variables (macroeconomic determinants) had a significant impact on Sensex performance. A strong correlation amongst macroeconomic conditions and stock market performance was shown by Reddy et al. (2019). The findings demonstrated a robust association between macroeconomic variables and the four selected sectoral indices.

Nonetheless, a number of research in other nations have also been undertaken to determine the long- and short-term connection between the factors. Kibria et al. (2014) studied how five important macroeconomic variables affected Pakistan's market performance. They discovered a unidirectional granger cause between the KSE100 and the exchange rate, GDP, and savings. The KSE100 is also affected by inflation, the exchange rate, GDP, savings, and the money supply, as shown by regression analysis. Stock market and macroeconomic determinants were analysed by Barakat, Elgazzar, and Hanafy (2015) for two developing nations. Exchange rate, general price level (as assessed by CPI), money supply, and interest rate were found to be co-integrated with stock return for both nations. Moreover, the aforementioned four variables are causally related to the EGX 30 (Egypt market index), although CPI is not causally related to Tunindex but the other three are. Further, using a Granger causality test, Chauque and Rayappan (2018) empirically examined the link between inflation, currency rate, and the return on Malaysian stocks. Short-term results demonstrated no granger causality between the variables of interest and the KLCI, while long-term results did show a correlation between the KLCI and inflation in just one direction. Previous research has used a wide variety of time series models and techniques to investigate the connection between macroeconomic factors and stock indexes. Stock index returns for the BRICS countries were analysed by Gay (2016), along with their corresponding macroeconomic indicators. Research looked at monthly averages of several indices and macro factors including oil price and FX rates from 1999 to 2006. The link between the return on the index, the oil price and exchange rate are identified by the Box-Jenkins (ARIMA) model. The index results were not correlated with any of the individual macroeconomic factors. They concluded a low level of efficiency in the BRICS market since there was no evidence of a correlation between previous and current index performance. Gross domestic product (GDP), exchange rate (FX), inflation (INF), money supply (MS), interest rate (IR), etc. are all examples of macro variables often employed to test for a correlation.

Relationship analysis is studied by academics using both cutting-edge and time-tested methods. Long-term connections between macroeconomic variables and the CNX Energy, IT, Auto, Bank, and FMCG indexes were uncovered by Tripathi, Parashar, and Jaiswal (2014). Based on the study's regression analysis, it's clear that FII has a significant effect on

all of the industries that were examined. From 1995-2014, Tripathi and Kumar (2015) analysed the effect of macroeconomic factors (a source of systematic risk) on the BRICS market's aggregate stock return. The ARDL model was used to examine both individual and panel data, and quarterly data was selected for analysis. Consistent with expectations, the analysis discovered a strong negative link between the interest rate, oil price, and exchange rate, whereas the money supply had a considerable positive influence. Short-term and long-term correlations between the Sensex and several macroeconomic variables were analysed by Giri and Joshi (2017). Using yearly data from 1979–2014, they tested short and long-run causality with VECM, examined long-run relationships with ARDL, and predicted long-run exogenous shocks to selected variables using variance decomposition.

### Objectives of the study

The determination of this investigation is to establish a connection between the Sensex's performance and several macroeconomic factors pertaining to India, such as the country's GDP, unemployment rate, the value of the US dollar, inflation rates, the debt to GDP ratio, and the manufacturing to GDP ratio. This research aims to build a time series model using the aforementioned factors.

### Methodology

Data of macroeconomic indicators and Sensex are gathered from year 2011 to 2020. Secondary in nature, the data is gathered once a year. Growth in gross domestic product, inflation, unemployment, debt as a percentage of gross domestic product, the US dollar, and the manufacturing output as a percentage of gross domestic product are some of the macroeconomic indicators utilised as independent variables. The data is compiled from a wide range of sources, including the Reserve Bank of India's and the Organisation for Economic Co-operation and Development's respective websites, among others. Due to the secondary nature of the data, a time series analysis is conducted.

### ResultAnalysis

The ADF Test is used to find the series's unit root. The null hypothesis of ADF test is: The series is not stationary. The ADF test results for each variable are shown in Table 1.

**Table1:ADFTestProbabilities**

Name	At Level	At1st Difference
Sensex	0.001	-
GDPgrowth	0.001	-
Unemployment	0.002	0.0201
USDollar	0.003	-
Inflation	0.001	-
DebttoGDPRatio	0.542	0.0005
ManufacturingtoGDPRatio	0.895	0.0051

According to the ADF test, the debt-to-GDP ratio is not stable at levels but is stationary at the first difference, as are the manufacturing and unemployment rates. GDP growth rate, Sensex return, inflation, and US dollar return are all stuck at their current levels. Given that some of the variables are fixed at their current values and others at the initial difference, the ARDL model may be used to verify the nature of the series's connection.

The optimal lag selection criteria are shown in Table 2. Using the Akaike Information Criterion (AIC), a test of vector autoregression is conducted. This leads us to choose AIC as our criterion for choosing the best lag.

**Table 2: Criteria for Optimum Lag**

Determinant residual covariance	1.40E-51
Determinant residual covariance	3.39E-41
Log likelihood	593.8647
Akaike information criterion(AIC)	-37.74125
Schwarz criterion(SC)	-32.63547
Number of coefficients	104

The Bound test of the ARDL model at the 5% level indicates an F-statistic of 15.24, with upper and lower bounds of 4 and 2.87, respectively. There is a short-run association if the F-statistic is smaller than the lower limit, and a long-run relationship if the F-statistic is bigger than the upper bound. Bound test results showing an F-statistic of 15.2 (more than 4) support the existence of a long-run correlation between the Sensex and macroeconomic factors.

Table 3 displays the ARDL model's output. As to ARDL model, the return of the US Dollar has a strong positive influence on the return of Sensex. Changes in the value of the US dollar result in a 3.134% shift in Sensex returns. The Sensex moved by 0.49% due to a 1% shift in the value of the debt to GDP ratio. The inflation rate has dropped, and the Sensex has risen 3.05% as a result. The Sensex fluctuates by 6.89% with every 1% drop in the unemployment rate. A 1% change in the manufacturing to GDP ratio generates a change of 3.45% in Sensex. The Sensex reacts by 11.78% for every 1% change in GDP growth. Since the probability of the residual is just 0.0180, the fact that the error correction term is negative (-1.068177) is quite important.

**Table3:ARDL Test**

Name	Coefficients	Name	Coefficients
GDP growth	11.78520	Inflation	-3.057601
Unemployment	-6.890633	Debt to GDP ratio	0.495711
US Dollar	3.134800	Manufacturing to GDP ratio	3.456560

The residual series is then created and used as a regressor to all of the dependent variables in order to get the errors. Since 'K' equals 2, the maximum number of delays that may be employed is 2.

### Testing for Stability and Residuals

To ensure a good model fit, a residual diagnostic is run. To identify autocorrelation, an LM test of serial correlation is carried out. The absence of autocorrelation in the series is the test's null hypothesis. The LM-null hypothesis is accepted due to an F-statistical significance level of 0.7026 (p value > 0.05). Therefore, it may be inferred that the chosen series has no autocorrelation. Stability diagnostics (the CUSUM Test) are also run to guarantee the model's durability. Cumulative sum charts show that the data points are contained inside the chart's boundaries, indicating that the model is valid.

### Conclusion

In this study, we looked at how several macroeconomic factors affect India's stock market (Sensex). The Sensex return was used as the dependent variable, with six other factors. Since the F-statistic is larger than the upper limit, the limit test verifies the existence of a long-term link between the independent and dependent variables. Growth in gross domestic product, the value of the US dollar, the debt to GDP ratio, and the manufacturing to GDP ratio all have a positive effect on the Sensex, while inflation and the unemployment rate have a negative effect. Granger Causality test results show that the variables have a two-way connection. The outcome of current and past inquiries is in the same line. The findings of this research would benefit the policymaking and regulatory communities as well as the investing industry. The GARCH family of models may be used to learn more about volatility, and an impulse-response analysis can be performed to examine how each independent variable affects the dependent one.

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