

Effects of Macroeconomic Factors on Indian Stock Market Performance: An Empirical Analysis

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ABSTRACT

This paper examines the macroeconomic factors that influence the performance of the Indian stock market index, NIFTY 50. The study is distinctive in that it employs both primary and secondary data to draw conclusions. Initially, nine years of monthly data on macroeconomic variables are analyzed using logistic regression against the monthly performance of the NIFTY 50 index. In the second stage, the results of the regression analysis are corroborated with primary data collected through face-to-face interviews with stock market experts. The secondary data analysis indicates that the Dow Jones Index and exchange rate movements are the primary determinants of the NIFTY 50 index. However, experts suggest that other factors, such as political stability, economic conditions in developed countries, and India's bilateral relations with other nations, are also crucial in forecasting the movement of the NIFTY 50 index. This study is the first in the Indian context to combine domestic and international factors to forecast the NIFTY 50 index movement.

Keywords: Macroeconomic variables, India, Logistic regression, NIFTY

1. Introduction

Several economic indicators, commonly referred to as macroeconomic variables, are instrumental in analyzing the performance and behavior of the stock market. These indicators reflect the overall state of the economy and include factors such as the business environment, interest rates, inflation, exchange rates, monetary policy, and foreign direct investment (FDI). The study of variables that influence stock returns is one of the most prominent areas of financial research. According to the fundamental stock valuation model, a stock's price is determined by the "anticipated cash flows" and the "required risk-adjusted rate of return," which is based on the stock's inherent risk. Both the risk-adjusted discount rate and a firm's cash flows are influenced by macroeconomic data, which, in turn, affects stock market performance (Dutta et al., 2012). The overall stock market return is thus dependent not only on macroeconomic factors but also on the performance of individual companies. Numerous empirical studies conducted in developed countries [Morelli, (2002); Flannery & Protopapadakis (2002); Gjerde & Sættem (1999); Adam & Tweneboah (2008)] as well as in emerging markets [Yartey, (2010); Tangjitprom (2011)] provide substantial evidence supporting the relationship between macroeconomic drivers and stock market performance.

In India, macroeconomic variables such as interest rates, inflation, monetary policy, exchange rates, and FDI have undergone significant changes over the past decade. The Indian economy, measured in terms of GDP, has expanded from 1.83 trillion USD in 2012 to 3.25 trillion USD in 2022 ("India Is Now a US\$ 3.1 Trillion Economy," 2022). Correspondingly, the broader stock market index, NIFTY 50, has risen from 5,339 in March 2012 to an all-time high of 18,105 in December 2022. This growth in the NIFTY 50 index, with a compounded annual growth rate (CAGR) of 13%, has been shaped by the evolving macroeconomic landscape in the country.

The changing dynamics of the business and economic environment have made financial markets more efficient. Stock markets now respond swiftly to any news, whether it pertains to political challenges, war situations, regulatory shifts

in the corporate environment, or movements in international markets, thanks to the widespread availability of information. At this critical juncture, as India emerges as one of the world's most attractive investment destinations, a comprehensive understanding of the factors driving the stock market is essential.

The aim of this study is to investigate and understand the macroeconomic factors that influence the Indian stock market. The most recent research on a similar topic, conducted by Chellaswamy et al. (2020), provides an opportunity to further explore this area by identifying new variables or reassessing the relative importance of previously established macroeconomic factors that affect stock market performance. In earlier studies, conclusions were typically drawn solely from the statistical analysis of secondary data. However, in this paper, the authors arrive at their conclusions by integrating both primary and secondary data. Using a qualitative approach that includes expert interviews and a semi-structured, open-ended survey, the findings from the secondary data analysis are corroborated.

This study contributes to the existing literature by building on previous research within the Indian context. The findings are intended to assist investors, decision-makers, stock analysts, fund managers, and company promoters in better understanding the relationship between stock market performance and macroeconomic factors. The remainder of the paper is organized into six sections. Section 2 provides a literature review to identify the research gap, which is further elaborated in Section 3. The research methodology is discussed in Section 4, followed by the results of the data analysis in Section 5. Section 6 discusses the study's findings and their implications. Finally, Section 7 presents the conclusions, limitations, and future research directions.

2. Literature Review

This section reviews the relevant literature, focusing primarily on the relationship between macroeconomic variables and stock market performance. Given the extensive research on this topic, the review is concentrated on key macroeconomic factors and their connection to stock market outcomes, with a specific emphasis on findings from studies conducted in India. The relationship between macroeconomic factors and stock market returns has been a subject of significant scholarly attention. Although the findings are sometimes inconsistent, the majority of studies have found evidence suggesting a link between macroeconomic factors and stock market performance. A seminal work by Chen et al. (1986) laid the groundwork for subsequent research in this field. They investigated whether new macroeconomic variables represent risks that are rewarded by the stock market, concluding that macroeconomic variables are indeed costly sources of risk factors that influence stock market performance. Additionally, they noted that the market portfolio and overall consumption were not individually priced. Their findings also indicated that the stock market risk associated with oil prices did not receive specific compensation.

In the Indian context, the topic has also been extensively studied. For example, Ahmed (2008) explored the causal relationships between stock prices and key macroeconomic variables representing the real and financial sectors of the Indian economy, using quarterly data from March 1995 to March 2007. The study utilized the BSE Sensex and NIFTY 50 indices as dependent variables, with independent variables including the industrial production index, exports, foreign direct investment, money supply, exchange rate, and interest rate. To assess short-run relationships, BVAR modeling for variance decomposition and impulse response functions were employed, while Johansen's cointegration method and the Toda and Yamamoto Granger causality test were used to investigate long-run interactions. The study revealed that multiple causal relationships exist between stock indices and aggregate macroeconomic variables over time. According to the findings, the Indian stock market is influenced by both current performance and anticipated future potential.

Agrawalla and Tuteja (2008) conducted a study to assess whether the share price index could serve as an indicator of economic activity in India. They analyzed time series data on various macroeconomic variables, including the share price index, industrial production, money supply, credit to the private sector, and exchange rates, covering the period from November 1965 to October 2000. Using a multivariate vector error correction model to explore the relationships, they found that causality flowed from economic growth—represented by industrial production—to the share price index, rather than the reverse. Ghosh et al. (2010) found that the call money market and inflation had an insignificant impact on stock market returns. However, Srivastava (2010) presented conclusions that contradicted Ghosh et al.'s findings, asserting that both interest rates and inflation did indeed influence India's stock market performance. Srivastava further argued that domestic factors had a greater impact than international ones. Additionally, Agrawal and Srivastava (2011) identified a

relationship between exchange rates and the Indian stock market. Ahuja et al. (2012) examined the connections between various macroeconomic factors—such as industrial production, inflation, call rates, exchange rates, gold and oil prices, and foreign institutional investors (FIIs)—and the Indian stock market. Using regression and correlation techniques, they concluded that the exchange rate, call rate, and FIIs were more influential on the Indian stock market compared to the other macroeconomic factors included in their analysis.

Tripathi and Seth (2014) explored the causal linkages between stock market performance and specific macroeconomic indicators in India. They analyzed monthly data from July 1997 to June 2011 using various methodologies, including factor analysis, ADF and PP unit root tests, regression analysis, the ARCH model, Granger causality tests, and the Johansen co-integration test. Additionally, they employed Impulse Response analysis to examine how the stock market responds to shocks originating from the real economy. Their findings revealed a strong relationship between macroeconomic variables and stock market indicators, with factor analysis identifying inflation, interest rates, and exchange rates as the three primary determinants of stock market performance. Singh (2014) utilized Granger causality tests and multivariate stepwise regression analysis to investigate the relationship between macroeconomic variables and the Indian stock market. The study used explanatory variables such as the Index of Industrial Production, Wholesale Price Index, Money Supply (M3), Interest Rates, Trade Deficit, Foreign Institutional Investment, Exchange Rate, Crude Oil Price, and Gold Price against the monthly closing prices of the BSE Sensex and NIFTY 50 indices. The findings indicated that money supply and foreign investment had significant positive effects on the stock market, while the exchange rate had a negative impact during the study period. However, it is noteworthy that the data used in this analysis covered only a short period, from January 2011 to December 2012. Ramanujam and Leela (2014) examined various macroeconomic factors, including GDP, currency rates, and industrial production, and their effects on the stock market. The study found that GDP had a significantly positive impact on the capital market, while industrial production (IIP) and exchange rates had significantly negative impacts. Aanchal (2017) attempted to assess the relationship between GDP, inflation, exports, imports, investments, and the Indian stock market. The study found that inflation was negatively correlated with GDP, exports, and imports, while all other variables were positively correlated. Giri and Joshi (2017) investigated both long- and short-term relationships between macroeconomic variables and the Indian stock market. They found that factors such as inflation, currency rates, and economic growth had a positive impact on the stock market, while oil prices had a negative effect. The Vector Error Correction Model further revealed a directional relationship between stock market growth and foreign direct investment, applicable in both short- and long-term contexts.

Misra (2018) explored the impact of various macroeconomic factors—including the Index of Industrial Production (IIP), inflation, interest rates, gold prices, exchange rates, foreign institutional investment (FIIs), and money supply—on the Indian stock market. The study found a strong long-term correlation between these variables and stock market performance. Megaravalli and Sampagnaro (2018) examined the relationship between macroeconomic factors and the stock markets of China, India, and Japan. Their use of the Johansen test identified a long-term relationship between the stock markets of China and India and their respective inflation rates. The Granger causality test indicated a bidirectional causal relationship between the exchange rate and the Indian stock market. However, no correlation was established between Japanese stock market inflation and Indian stock prices. The study found a positive long-term relationship between the Indian stock market and the exchange rate, and between the Chinese stock market and inflation. The most recent study on this topic by Chellaswamy et al. (2020) reported that while the exchange rate was found to be insignificant, inflation had a significant and positive effect on India's stock market index.

3. Research Gap

In India, extensive research has been conducted on the topic of macroeconomic factors influencing the stock market over the past two decades. However, a consensus has yet to be reached. Studies differ significantly in terms of independent variables, data frequency, and analytical methods. Monthly data is generally preferred over quarterly data to increase the number of observations, yet the use of GDP as an independent variable is limited due to the availability of quarterly rather than monthly GDP figures in India. Furthermore, the Wholesale Price Index (WPI) in India includes prices for gold, crude oil, and other commodities, totaling 696 items. The author argues that including WPI, gold prices, and crude oil prices as independent variables introduces multicollinearity. To address this issue, the author suggests using only the WPI and excluding gold and crude oil prices as independent variables. Lastly, given the interconnected nature of global financial markets due to international investors, it is crucial to evaluate the impact of major global stock indices on the Indian stock

market. The author proposes incorporating the monthly price changes of the US Dow Jones Industrial Average as an independent variable, which has not been studied in the Indian context. This addition aims to address the research gap identified by Chellaswamy et al. (2020). Additionally, incorporating qualitative data obtained through questionnaires and interviews with experts will address the study gap noted by McConnell et al. (1986).

4. Research Methodology

This section outlines the methodology for estimating the relationship between macroeconomic variables and stock market performance, including data sources, research variables, and the development of an empirical model.

4.1 Research Variables And Sources Of Data

To analyze the performance of the Indian stock market, the study selects key macroeconomic variables: inflation, interest rates, money supply, and exchange rates, based on a comprehensive literature review. Inflation is measured using the Wholesale Price Index (WPI), interest rates are represented by the 365-day Government of India Treasury bills, and money supply is reflected by broad money (M3). The exchange rate is indicated by the monthly percentage change in the US Dollar (USD) to Indian Rupee (INR). The NIFTY 50 index is used as a proximate measure of market performance. Pathania and Swami (2000) reported a strong positive correlation (0.984) between the NIFTY 50 index and the BSE Sensex, suggesting that using either index as a dependent variable is appropriate. For this study, the monthly percentage change in the NIFTY 50 index is used as the dependent variable.

Previous research has predominantly focused on domestic macroeconomic factors. However, recognizing that the Indian market is influenced by the global economic environment, this study introduces the monthly percentage change in the Dow Jones Industrial Average (DJIA) as an additional independent variable, which has not been previously studied in the Indian context. This study is thus the first to integrate both domestic and global macroeconomic variables. The analysis covers nine years of financial data, from January 2015 to December 2023. Monthly historical data on interest rates, inflation, broad money, and exchange rates are obtained from the Reserve Bank of India (RBI) website (DBIE, n.d.). Monthly percentage change data for the NIFTY 50 and the Dow Jones Industrial Average are sourced from Yahoo Finance (NIFTY 50 (^NSEI) Historical Data - Yahoo Finance, n.d.). Based on the identified research variables, the following regression equation is proposed:

$$\text{NIFTYPERFORMANCE } (0, 1) = \beta_0 + \beta_1 \text{ Inflation} + \beta_2 \text{ Dowjones} + \beta_3 \text{ Money Supply} \\ + \beta_4 \text{ Exchange Rate} + \beta_5 \text{ Interest Rate} + e \quad \text{Eq... 1}$$

4.2 Methods of Data Analysis

The data analysis process consists of two stages. The first stage involves the use of secondary data. Regression analysis is employed to model the relationships between variables, evaluate the strength of these relationships, and make predictions based on the established models. When the relationship between the variables is assumed to be linear, simple or multiple linear regression methods are applicable (Davis, 2005). However, if the relationship deviates from linearity, various non-linear techniques may be utilized to achieve a more accurate regression. For scenarios where the response variable is binary (i.e., yes or no), logistic regression is employed. Logistic regression produces a function that illustrates how the relationship between predictors and the probability of the event (yes or no) varies (Tabachnick & Fidell, 2001).

The present study aims to develop a model to categorize NIFTY 50 index performance into two distinct groups (good or poor) using logistic regression. The classification of performance into good or poor is based on whether the monthly return of the NIFTY index is positive or negative. A set of macroeconomic indicators is used as independent variables to forecast their impact on NIFTY performance. As demonstrated by McConnell et al. (1986), qualitative data can provide additional insights to enhance the precision of stock price movement predictions. Consequently, in the second stage of data analysis, primary data collected through questionnaires, surveys, and interviews is categorized and transcribed. Matrix coding is performed using qualitative analysis software such as NVivo to identify and understand patterns in the data.

5. Empirical Results

This section presents the findings from the analysis of the impact of macroeconomic variables on the performance of the NIFTY 50 index. The analysis is conducted in two steps. The first step involves presenting descriptive statistics, testing the model's appropriateness using Omnibus Tests of Model Coefficients and the Hosmer & Lemeshow Test, and examining regression coefficients followed by model validation. The second step discusses the results of the primary data analysis.

5.1 Statistical Findings

Table 1 displays the descriptive statistics for the observed data. The terms mean, median, minimum, and maximum are clearly defined. The standard deviation values indicate that the monthly changes in the NIFTY index exhibit greater volatility compared to other variables.

Table 1: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Interest Rate	108	-.77	1.20	.1328	.48856	.239
Dow Jones	108	-3.40	1.14	-1.6451	.78746	.620
Inflation	108	-1.06	.39	-.2509	.37068	.137
Exchange Rate	108	-3.10	-1.41	-1.9923	.38722	.150
Money Supply	108	6.99	7.32	7.1547	.09946	.010

Source: SPSS Data Analysis

A logistic regression model was conducted to determine whether interest rates, the performance of the Dow Jones Industrial Average, inflation, exchange rates, and money supply can predict the odds of NIFTY 50 index performance. The results of the logistic regression analysis are presented in Table 2.

Table 2: Output of Logistic Regression

	B	S.E.	Wald	df	Sig.	Exp(B)
Interest Rate	-.074	.069	.367	1	.024	.9286
Dow Jones	.104	.092	1.278	1	.011	1.109
Inflation	.027	.277	.010	1	.922	1.028
Exchange Rate	4.392	6.786	3.378	1	.012	80.801
Money Supply	-.014	.000	.045	1	.832	.9860
Constant	.285	1.048	.074	1	.786	1.330
Nagelkerke R ²	.440					
<i>n</i>	108					
Classification Rate (%)	67.000					
Good Performance (%)	80.700					
Poor Performance (%)	48.800					
Hosmer and Lemeshow Test	0.731					

The chi-square value from the Omnibus Test of Model Coefficients indicates that the overall goodness-of-fit of the model is highly significant, with $\chi^2(5, n = 108) = 13.079$, $(p < 0.05)$. This suggests that the model effectively differentiates between good and poor performance of the NIFTY 50 index. The independent variables account for 44% of the variance in NIFTY 50 performance, as indicated by the Nagelkerke R^2 . The model correctly classifies 67% of cases into two categories: good (80.7%) and poor (48.8%). Additionally, the Hosmer and Lemeshow test supports the model's validity, with a chi-square value of 5.248 and a significance level of 0.731. Since this p-value is greater than 0.05, it provides further evidence of the model's adequacy.

5.2 Validation Of Model

To validate the model's predictive capability, split-group validation is employed. The model is tested using a random sample split into a 70/30 ratio. The consistency of the results across these two groups suggests that the original statistical findings are robust and reliable.

5.3 Results Of Multi-Method Research Findings From Experts

Responses were gathered from market investors and domain experts following the secondary data analysis. A total of ten respondents participated in the survey: six from India and four from other countries (two from the USA, one from Germany, and one from Australia). The international respondents are of Indian origin and have investments in the Indian capital market. Of the ten respondents, six (four from outside India and two from India) provided their responses via email, while the remaining four Indian respondents (two equity analysts and two academicians) were interviewed in person. The average stock market investment experience among all respondents is 11 years. The expert responses are illustrated in a line graph, as shown in Figure 1.

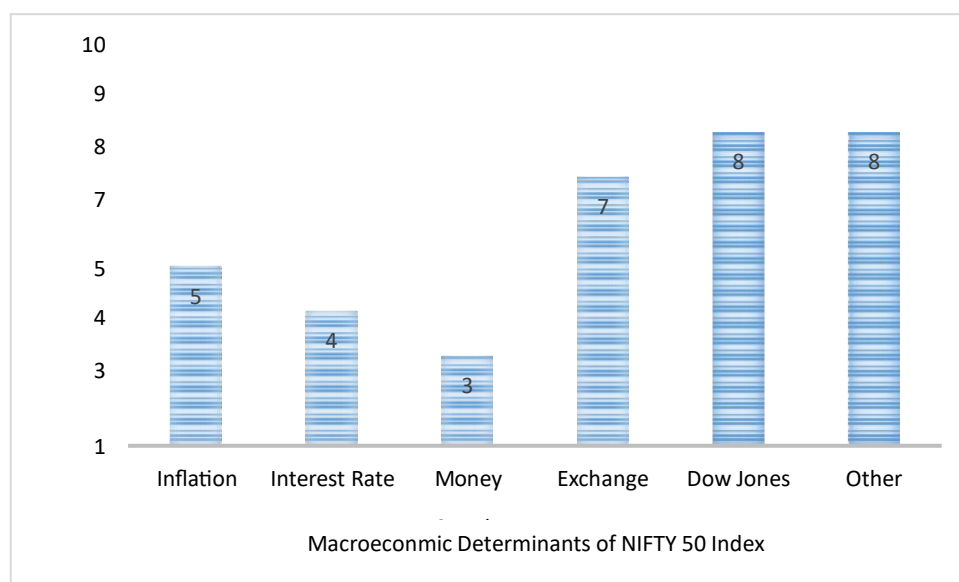


Figure 1: Respondents Opinion

Source: Authors Compilation

Most respondents identified the exchange rate and Dow Jones Industrial Average performance as significant determinants of NIFTY returns, highlighting the synchronization of the Indian stock market with the global economy. According to the respondents, domestic factors such as inflation, money supply, and interest rates are managed by the government through adjustments in key interest rates (CRR, SLR, Repo, and Reverse Repo). Since international factors are beyond national control, NIFTY is more susceptible to global influences. Inflation was noted as a primary concern for the economy. Although significant inflation is not a frequent occurrence in India, the market reacts negatively to rising inflation but recovers when inflation decreases. One expert remarked that while inflation can affect NIFTY, it cannot control it. In addition to quantitative variables, eight respondents emphasized the importance of diplomatic relations among major nations (e.g., US-China, US-Russia, Russia-China, UK-China), domestic political stability, and government transparency as key determinants of stock market performance. The author, while acknowledging the lack of established statistical methods to measure political stability and its impact on stock market success, verified these insights through observations. Notably, except during global pandemics, the NIFTY 50 index has consistently delivered positive returns during a decade when India was governed by a single party with a parliamentary majority. The author concludes that incorporating both quantitative and qualitative factors, rather than focusing solely on one, may yield more accurate market index forecasts.

6. Discussion

Interest rates exhibit a negative relationship with stock returns. A reduction in interest rates decreases borrowing costs, which encourages businesses to take on more debt, leading to increased profitability and, consequently, higher stock prices. This appreciation in stock prices is reflected in the performance of the NIFTY 50 index. Gjerde and Sættem (1999) also demonstrate a negative correlation between interest rates and stock prices. Thus, the stock market benefits from low interest rates and suffers under high interest rates, indicating an inverse relationship between interest rates and NIFTY 50 performance over the long term. Inflation shows a positive correlation with NIFTY performance. This finding is consistent with the studies of Maysami et al. (2004) and Ratanapakorn and Sharma (2007). The rapid growth of the Indian economy and capital markets suggests that equities are acting as a hedge against inflation in India. The positive performance of the NIFTY reflects the market's perception of inflation as a driver of economic growth in India. Similarly, a positive relationship with money supply indicates that an increase in money supply stimulates economic activity and enhances corporate profits, which in turn boosts stock prices and overall market performance. These findings align with the research of Mukherjee and Naka (1995) and Sohail and Hussain (2009). The present study reveals a positive association between exchange rates and NIFTY index performance. This positive relationship can be attributed to significant investments by foreign institutional investors (FIIs), which have increased due to the long-term devaluation of the Indian rupee (INR). The progressive depreciation of the domestic currency has allowed FIIs to benefit from market growth and profit repatriation. Additionally, if export demand is elastic, currency depreciation boosts demand for Indian exports, particularly in commodities and IT services, which enhances cash flows within the country. This effect depends on whether the nation is more export-oriented or import-oriented, and the findings are consistent with Mukherjee and Naka's (1995) observation of a positive correlation between currency rates and stock returns. The United States, being the world's largest economy, exerts a substantial influence on global markets. Negative developments in the US stock markets can significantly impact other markets, including the Indian stock market. Globalization has led to an interconnected global economy, where markets are intricately linked through various business channels. This interconnectedness was evident during the 2008 financial crisis, which affected economies worldwide. Consequently, the relationship between the NIFTY 50 and the Dow Jones Industrial Average reflects the broader interconnectedness of global financial markets.

7. Conclusion, Limitations, and Future Scope of Research

This study underscores the relationship between macroeconomic factors and the performance of India's stock market, specifically the NIFTY 50 index. The findings reveal a moderate predictive power of macroeconomic variables on the performance of the NIFTY 50. Key conclusions of this research are as follows: First, the performance of the NIFTY 50 is more closely correlated with global factors such as the Dow Jones Industrial Average and exchange rate fluctuations. Second, qualitative analysis of primary data suggests that additional variables may also influence NIFTY performance, although there is a slight divergence between expert opinions and quantitative data. These results have significant implications, particularly for developing countries like India, indicating that investors may better mitigate stock market volatility and enhance portfolio performance by incorporating the study's recommendations. However, the study is not without limitations. The reliability of the findings is contingent upon the accuracy of the secondary data used. Additionally, not all potential variables affecting NIFTY 50 performance were included in this study, primarily due to data constraints. It is anticipated that this research will stimulate further discussion and justify additional exploration in this area, especially within the Indian context. Future research could benefit from incorporating a broader range of factors, such as political stability, economic conditions in major developed nations (e.g., the USA, UK, Japan), and bilateral relations between India and other countries. Moreover, exploring reverse causality is essential for policy development and decision-making, as it is often overlooked in current literature.

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