Impact of Macroeconomic Variables on the Performance of the Indian stock market

Dr Amit Hedau

National Institute of Construction Management and Research, Hyderabad, India.
ahedau@nicmar.ac.in

Abstract

This paper analyses the macroeconomic factors influencing performance of Indian stock market index NIFTY 50. The study is unique in nature as it employ both, primary and secondary to derive the conclusion. Initially, nine years monthly data of macroeconomic variables are regressed against monthly performance of NIFTY 50 index using logistic regression. In second stage the outcome of regression analysis is ratified with primary data collected through face to face interview of the stock market expert. The secondary data analysis confirm Dow jones index and exchange rate movement are the main determinants of NIFTY 50 index. However, expert opined that other factors like political stability, economic situation in developed and bilateral relations of India with other countries are also important to forecast the NIFTY 50 index movement. This is the first study in Indian context, to combine domestic and international factors to forecast NIFTY 50 index movement.

Keywords: Macroeconomic variables, India, Logistic regression, NIFTY.

1. Introduction

Several economic indicators, also referred to as macroeconomic variables, can be used to analyze the performance and behavior of the stock market. The macroeconomic indicators indicate the general state of the economy. Business environment, interest rates, inflation, exchange rate, monetary policy, and foreign direct investment are all closely tied to the macroeconomic factors. Studies on the variables influencing stock returns are one of the most well-liked fields of financial research. According to the fundamental standard stock valuation model, the "anticipated cash flows" from the stock and the "necessary risk adjusted rate of return" based on the riskiness of the stock are what determine the stock price. The risk-adjusted discount rate and a firm's cash flows are both impacted by macroeconomic data. Macroeconomic factors can affect the stock market performance (Dutta et al., 2012). The return of the stock market as a whole depends on macroeconomic factors as well as the success of specific companies. Many empirical research in developed countries [Morelli, (2002); Flannery & Protopapadakis (2002); Gjerde & Saettem (1999); Adam & Tweneboah (2008)] and emerging nations [Yartey, (2010); Tangjitprom (2011)] provide strong support for the idea that there are connections between macroeconomic drivers and the performance of the stock market.

The macroeconomic variables including interest rate, inflation, monetary policy, exchange rate, and FDI have altered significantly in India over the past ten years. India's Economy (in terms of GDP) has grown from 1.83 trillion US$ in 2012 to 3.25 trillion US$ in 2022 ("India Is Now a US$ 3.1 Trillion Economy," 2022). The broader stock market indicator, NIFTY 50 has increased from 5339 in March 2012 to an all-time high of 18105 in December 2022. The macroeconomic factors in the nation's economy have produced an environment with a CAGR of 13% in NIFTY 50 index.

Financial markets are now more effective as a result of the changing dynamics of the business and economic environment. Whether there are political difficulties, war situations, regulatory changes in the corporate environment, or moves in international markets, stock markets respond quickly to any news due to widely available and simple to access information. At this juncture, the in-depth knowledge of the stock market's drivers is essential as India grows to be one of the world's most popular investment destinations.

The aim of the present study is to investigate and comprehend the macroeconomic factors that influence the Indian stock market. The most recent study on a related issue conducted by Chellaswamy et al. (2020) provides adequate opportunity to further examine the subject by identifying new variables or changing the relative importance of previously established macroeconomic variables that affect stock market performance. In earlier research, the statistical results of secondary data analysis were typically reported as the study's conclusion. In the current paper, the author's conclusion was reached using

both primary and secondary data. Using a qualitative methodology that combines expert interviews and a semi-structured open-ended survey, the results of secondary data analysis are ratified.

The current study adds value to the body of literature by referring past studies in the Indian context. The study's findings will also help investors, decision-makers, stock analysts, fund managers, and company promoters better comprehend the connection between stock market performance and macroeconomic factors.

Six sections make up the remainder of the paper. A survey of the literature is covered in Section two to determine the research gap that is described in Section 3. The research methodology is covered in Section 4, and the results of the data analysis are covered in Section 5. The study's results and their consequences are discussed in section six. Conclusions, limitations, and the future scope of the research are discussed in Section 7.

2. Literature Review

In this section, the author has evaluated the pertinent literature. Because there is a lot of study on this topic, the author focuses mostly on macroeconomic variables and how they connect to stock market performance. In a later section, the author also reviews the results of Indian studies.

The relationship between macroeconomic factors and stock market returns has been extensively studied in the literature. Despite inconsistent findings, the majority of studies have shown evidence of a connection between macroeconomic factors and stock market performance. Chen et al. (1986) provided a foundation for future research in this area. They examined whether new macroeconomic variables are risks that the stock market rewards. They reported that macroeconomic variables are expensive sources of risk factors that affect stock market performance. The market portfolio and overall consumption were not priced individually, either. According to their findings, the stock market risk associated with oil prices were not specifically rewarded.

In India as well, the subject has received extensive study. Using quarterly data, Ahmed (2008) investigated the types of causal linkages between stock prices and the important macroeconomic variables that represented the real and financial sectors of the Indian economy from March 1995 to March 2007. These factors include the BSE Sensex and NIFTY 50 index in India as dependent variable and industrial production index, exports, foreign direct investment, money supply, exchange rate, and interest rate as independent variables. While BVAR modelling for variance decomposition and impulse response functions have been used to evaluate short-run relationships, Johansen's approach of cointegration and the Toda and Yamamoto Granger causality test have been used to investigate long-run interactions. He found that throughout time, multiple causal relationships exist between stock indexes and aggregate macroeconomic variables. According to the study, the Indian stock market appears to be influenced by both present and anticipated potential performance.

Agrawalla and Tuteja (2008) conducted a study to determine whether the share price index may be used to indicate economic activity in India. They used time series of monthly data for the period November 1965 to October 2000 for India on the macroeconomic variables, namely, share price index, industrial production, money supply, credit to the private sector, exchange rate. Using multivariate vector error correction model to investigate the connections, they reported the causality running from economic growth proxied by industrial production to share price index and not the other way round.

Ghosh et al. (2010) discovered insignificant impact of call money market and inflation on stock market return. Srivastava (2010) put forth conclusions that were in conflict with Ghosh et al. (2010). He discovered that the interest rate and inflation had an impact on India's stock market performance. He further asserted that local forces predominate over international ones. According to Agrawal and Srivastava (2011) exchange rates and the Indian stock market are related.

Ahuja et al. (2012) looked for connections between macroeconomic factors like industrial production, inflation, call rates, exchange rates, gold and oil prices, foreign institutional investors, and the Indian stock market. The exchange rate, call rate, and FIIs were found to be more significant to the Indian Stock Market than the other macroeconomic factors used in the analysis using the regression and correlation technique.

Tripathi and Seth (2014) investigated the causal linkages between the stock market performance and specific macroeconomic indicators in India. The monthly data from July 1997 to June 2011 was analyzed by employing factor analysis, ADF and PP Unit root tests, regression, the ARCH model, Granger causality, and the Johansen Co-integration test. Moreover, Impulse Response research has been used to examine how the stock market reacts to shocks brought on by the actual economy. They discovered a strong relationship between macroeconomic variables and stock market indicators. By factor analysis, they were able to pinpoint inflation, interest rates, and exchange rates as the three main determinants of stock market performance.

Singh (2014) used Granger's causality test and multivariate stepwise regression analysis to determine the relationship between macroeconomic variables and the Indian stock market. 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 were explanatory variables for the monthly closing prices of the BSE sensex and NIFTY 50 index. Her findings conclude that money supply and foreign investment both demonstrate their large positive effects on the stock market. During the study period, the exchange rate has a negative impact on the stock market. However the data on which this analysis is based only cover a short period from January 2011 to December 2012.

Ramanujam and Leela (2014) examined various macroeconomic factor such as GDP, currency rate, and industrial production and its effect the stock market. It was found that GDP had a significantly beneficial impact on the capital market, whereas IIP and exchange rates had a significantly negative impact. Aanchal (2017) attempted to test the relationship between GDP, inflation, exports, imports, and investments and the Indian stock market. Only inflation was shown to be negatively connected with GDP, exports, and imports; all other variables were found to be positively correlated.

Giri and Joshi (2017) examined the long- and short-term relationships between the macroeconomic variables and the Indian stock market. The stock market was positively impacted by factors like inflation, currency rate, and India's economic growth, while negatively impacted by oil prices. The Vector Error Correction Model also indicated that there was a directional relationship between growth in the stock market and foreign direct investment in both, the short and long terms. Misra (2018) examined the impact of macroeconomic factors such as IIP, inflation, interest rates, gold prices, exchange rates, FIIs, and money supply on the Indian Stock Market. The independent variables interest rate, IIP, inflation, gold, exchange rate, money supply, FIIs, and stock market were found to be strongly correlated over the long term.

Megaravalli and Sampagnaro (2018) investigates the connection between macroeconomic factors and the stock markets of three nations: China, India, and Japan. The Johansen test revealed a long-term relationship between the stock markets in China and India and their respective countries' inflation rates. The Granger causality test revealed a bidirectional causal relationship between the exchange rate and the Indian stock market. The correlation between Japanese stock market inflation and Indian stock prices could not be established. The Indian Stock Market and the Exchange Rate, as well as the Chinese Stock Market and Inflation, have a positive long-run relationship. The most recent study on the similar topic is conducted by Chellaswamy et al. (2020). They found exchange rate as insignificant whereas inflation significant and positively affecting India's stock market index.

3. Research Gap

In India, the extensive study has done on similar topic in last two decades. However, the consensus has not yet achieved. Further, each study varies in terms of independent variables, frequency of data and methods of data analysis. The monthly data is preferred over quarterly to include more number of observations in the analysis. Use of GDP as an independent variable reduces the number of observations in the study due to the fact that in India, quarterly GDP numbers are available and not monthly.

Secondly, In India, the WPI calculation include prices of gold, crude oil and other 695 commodities. In the opinion of author, inclusion of WPI, gold prices and crude oil prices as three independent variables gives multicollinearity among the independent variables. Author suggests the use of only one variable, WPI and exclude gold and crude oil prices as an independent variable.

Lastly, as the worldwide stock markets are united due to global investors, the impact of world's major stock index on India's stock market need to be evaluated. The author proposes monthly price change in US market index, Dow Jones Industrial Average as one of the independent variables which is not yet studied in previous studies in Indian context. The addition of new variables will fill-up the research gap identified by Chellaswamy et al. (2020). Additionally, by adding qualitative data gathered through questionnaires and interviews with domain-area experts, the study gap noted by McConnell et al. (1986) is filled.

4. Research Methodology

In order to estimate the relationship between macroeconomic variables and stock market performance, this section discusses data sources, research variables, and the development of an empirical model.

4.1 Research Variables and Sources of Data

The author has selected macroeconomic elements including inflation, interest rates, money supply, and exchange rates after a thorough review of the literature in order to explain the performance of the Indian stock market. WPI index numbers are used to measure inflation, whereas 365-day GoI T-bills and broad money (M3) are used to reflect interest rates and the money supply, respectively. The exchange rate is denoted by the monthly per cent change in US$ to INR. A proximate measure of market performance is the NIFTY 50 index. Pathania and Swami (2000) reported a strong positive correlation (.984) between NIFTY 50 index and BSE Sensex. As a result, in the author's perspective, using any one index movement as a dependent variable is appropriate. This study consider monthly percent change in NIFTY 50 index as dependent variable.

In prior research, only domestic macroeconomic factors were used. As the Indian market is not immune to the effects of the global economic environment, the author suggests the use of monthly per cent change in the closing values of the US Market Index- Dow Jones Industrial Average as new additional independent variable which is not yet studied in Indian context. Hence, this is the first study pertaining to India to integrate both domestic and global macroeconomic variables. The analysis spans nine years of financial data, from January 2015 to December 2023. The monthly historical information about interest rate, Inflation, broad money and exchange rates are obtained from the web site of Reserve Bank of India (RBI), country's central bank (DBIE, n.d.). The monthly per cent change data of NIFTY 50 and Dow Jones Industrial Average are obtained from yahoo finance database (NIFTY 50 (^NSEI) Historical Data - Yahoo Finance, n.d.). Based on identified research variables, following regression equation is proposed:

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

4.2 Methods of Data Analysis

Two stages are involved in the data analysis. The author used secondary data in the initial stage. Regression analysis is used to model relationships between variables, assess the strength of those correlations, and make predictions based on the models. When this relationship is taken to be linear, either simple linear regression or multiple linear regression is applicable (Davis 2005). However, if the relationship between the variables is not linear in the parameters, a number of non-linear techniques could be applied to produce a more accurate regression. In situations when the response variable can only accept binary values (yes or no), logistic regression is chosen. The result of logistic regression is a function that illustrates how the relationship between the predictors and the likelihood of the event (yes or no) changes (Tabachnick & Fidell, 2001).

The present study aims to create a model for categorizing NIFTY 50 index performance into two groups (good or poor) using logistic regression. The distinction between good and poor performance cannot be made with any certainty. A monthly return that is either positive (negative) for the NIFTY index is deemed good (poor). To forecast their impact on the NIFTY performance, a set of macroeconomic indicators is used as an independent variable. McConnell et al. (1986)

have demonstrated that qualitative data can offer further details to more precisely predict stock price movement. As a result, the primary information gathered through questionnaires, surveys, and interviews is classified and transcribed in the second phase of data analysis. Matrix coding has been performed using a qualitative tool such as NVivo to understand the pattern of codes.

5. Empirical Results

In this section, the author has presented the findings from an estimation of the impact of macroeconomic variables on the performance of the NIFTY 50 index. In the initial step, descriptive statistics, model appropriateness tests using the Omnibus Tests of Model Coefficients and Hosmer & Lemeshow Test, regression coefficients followed by model validation are presented. In the second step, the findings of the analysis of the primary data are discussed.

5.1 Statistical Findings

Table 1 presents the descriptive statistics of the observed data. The meanings of the terms mean, median, minimum, and maximum are obvious. The NIFTY index's monthly change is more volatile than other variables, according to the standard deviation values.

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

Logistic regression model was performed to see whether interest rate, Down Jones Industrial Average index performance, inflation, Exchange rate, and money supply predict the odds on NIFTY's performance. The results of Logistic regression are reported 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					
n	108					
Classification Rate (%)	67.000					
Good Performance (%)	80.700					
Poor Performance (%)	48.800					
Hosmer and Lemeshow Test	0.731					

The result of the chi-square value from the Omnibus Test of Model Coefficients shows that the overall indication of the goodness-of-fit test is highly significant at x^2 (5, n = 108) = 13.079, p < 0.05. This means that the model is able to distinguish between the good and poor performance of NIFTY 50 index. The set of independent variables explained 44% (Nagelkerke

R^2) of the variance in the Nifty 50 performance, and the model, as a whole, correctly classified 67% of the cases into two groups: good (80.7%) and poor (48.8%). In addition, the results from the Hosmer and Lemeshow's test also support our model as being worthwhile as the chi-square value for the test is 5.248 with a significance level of 0.731. As the value is larger than 0.05, it indicates support for the model.

5.2 Validation of Model

Split-group validation is used to confirm the model's predictive ability. The developed model is validated using a random sample of instances in a 70/30 ratio. It is reasonable to presume that the original statistical findings are true given that the results are not statistically different for the two groups.

5.3 Results of Multi-method research findings from experts

The responses from the market investors and domain experts are collected after analysis of the secondary data. Total 10 respondents participated in the survey. Out of ten respondents, 6 are from India and 4 are from other countries (2 from USA, 1 from Germany and 1 from Australia). The respondent from other country have their Indian origin and they are investors in the Indian capital market. Out of ten respondents, six (four outside India and 2 Indian) have communicated their responses through email. The remaining four Indian respondents (2 equity analyst and 2 academicians) were interviewed face-to-face. The average stock market investment experience of the all the respondents is 11 years. The responses from the expert are presented in the form of line graph as shown in Figure 1.
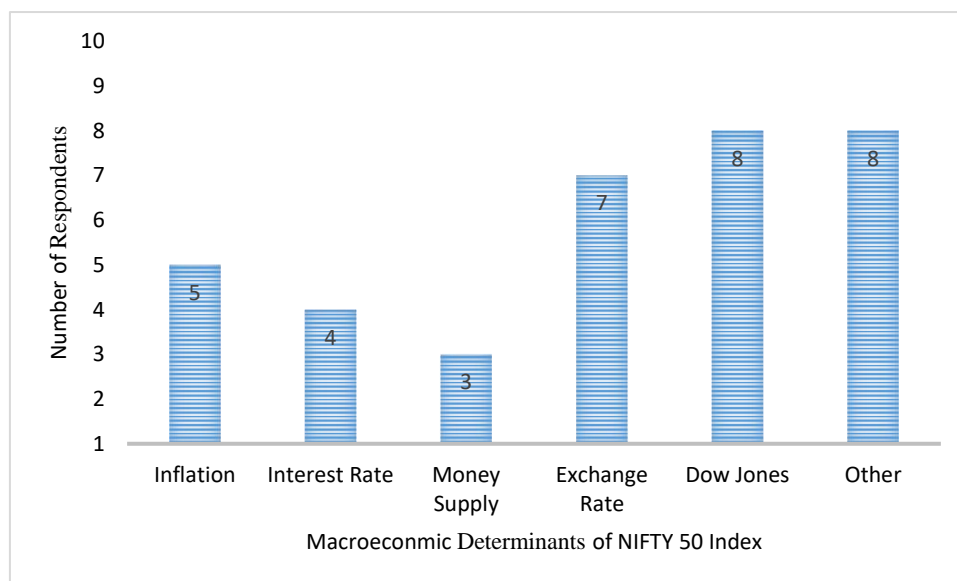

Figure 1: Respondents Opinion
Source: Authors Compilation

Most of the responded agreed to exchange rate and Dow Jones Industrial Average performance as important determinants of NIFTY returns. This evidence the synchronization of our stock market with global economy. In the opinion of respondent domestic factors like inflation, money supply and interest rate are corrected by the government by taking suitable measures such as change in key interest (CRR, SLR, Repo and Reverse Repo). As international factors are completely beyond our control, NIFTY is more susceptible to international factors. The main worry for the economy is inflation. Yet, India has not regularly seen significant inflation. The market responds unfavorably to an increase in inflation but turns around in response to a decline in inflation. While inflation can affect NIFTY, it cannot control it, one of the expert said. Other than the quantitative variables, eight respondents stressed the diplomatic relations among major nations like US-China, US-Russia, Russia-China, UK-China, domestic political stability, transparency in government functioning are also key determinants of stock market performance. The author tested the fact through observations, despite the fact that there is no

established statistical way to measure political stability and stock market success as advised by the experts. With the exception of times when there was a global pandemic, the NIFTY 50 index delivered positive returns for the last ten years that India has been governed by a single party with a majority in the parliament. The author comes to the conclusion that taking into account both quantitative and qualitative aspects, rather than focusing on just one, may result in better market index forecasts.

6   Discussion

Interest rates exhibit a negative link with stock returns. A decrease in interest rates lowers the cost of borrowing, which encourages businesses to borrow more and raises the value of their shares with increase in profitability. Such stock price appreciation is reflected in NIFTY's performance too. Gjerde and Saettem (1999) also show interest rate to be negatively related to stock prices. The implication is that the stock market enjoys low interest rates and despises high interest rates. Thus, the interest rates and the NIFTY 50 have an inversely correlated relationship over the long term.

Inflation has shown a positive relation with NIFTY performance. The findings are in line with Maysami et al. (2004) & Ratanapakorn and Sharma (2007). Indian economy as well as Indian capital markets are evolving at a rapid growth pace and hence preset study conclude that equities are serving as a hedge against inflation in India. The performance of NIFTY has benefited as a result of the Indian stock market's recognition of India's gradually rising inflation trends as an engine of the country's growth.

According to the positive relationship for money supply, an increase in money supply stimulates the economy and boosts corporate profits, which in turn raises stock prices and stock market performance. The findings are in line with Mukherjee and Naka (1995), Sohail and Hussain (2009).

Present study exhibits a positive association between exchange rates and index performance. Foreign institutional investors (FII) have made significant investments as a result of the long-term devaluation of the local currency (the Indian rupee, INR). The progressive devaluation of the domestic currency has enabled FIIs to profit from market growth as well as profit repatriation. Under the supposition that export demand is elastic, currency depreciation causes a rise in export demand (commodity and IT services specially) from India, which raises cash flows within the nation. If this is the case, the influence of the exchange rate relies on whether the nation is export- or import-dominant. The conclusions apply to the situation in India. According to Mukherjee and Naka (1995), currency rates and stock returns are positively correlated.

The United States is the world's biggest economy. Any negative news from the US stock markets has a big impact on other markets, especially the Indian stock markets. Globalization has resulted in the creation of a single economy that runs in lockstep across the entire planet. Every market is related to the rest of the world, either directly or indirectly, through countless businesses. It was witnessed that almost every nation's economy was impacted by the 2008 financial crisis. As a result, author wants to infer that the Nifty 50 and Dow Jones Industrial Average index clearly demonstrate a relationship between the two markets.

7   Conclusion, Limitations and Future Scope of Research

The macroeconomic factors and the performance of India's stock market indicator NIFTY 50 are both highlighted by the current study. The study's findings show a moderate predicting power between the performance of the NIFTY and macroeconomic factors. The main findings in this study are: First, the performance of the NIFTY is more correlated with global occurrences like the Dow Jones Industrial Average performance and the exchange rate. Second, a few additional variables may have an impact on NIFTY performance, according to a qualitative analysis of primary data. The expert's judgement slightly differs from what the quantitative data shows. The conclusions from the present research have significant ramifications, particularly for developing nations like India. In the opinion of author, the results of the study supported the idea that investors could better protect their portfolios from stock market volatility and improve portfolio performance if they adopted the study's recommendations.

The study does have certain limitations, though. The study's findings depend on how reliable the secondary data are that were utilized to support them. Secondly, not all of the variables that affect NIFTY 50 performance are taken into account in this research, primarily due to their unavailability in the database. However, it can be anticipated that initiatives like this study will increase discussion of the subject and provide justification for more investigation in this field, particularly in the context of India. Future researchers can expand their work by utilizing a wider range of factors, such as political stability, the economic situation in major developed nations like the USA, UK, and Japan, as well as bilateral ties between India and the rest of the world. Additionally, it is important to evaluate reverse causality for policy development and decision-making as it is unfairly disregarded in the literature at present.

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