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# THE RELATIONSHIP BETWEEN SELECTED MACROECONOMIC VARIABLES AND INDIAN STOCK MARKET PERFORMANCES: AN EMPIRICAL ANALYSIS

Dr. Dinkar Nayak[1] and Rubina Barodawala[2]

[1]RBI Chair Professor, RBI Endowment Unit, The Maharaja Sayajirao University of Baroda, Baroda
[2]Research Scholar, Department of Economics, The Maharaja Sayajirao University of Baroda, Baroda

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## ABSTRACT

The present study focuses on examining the relationship found in macroeconomic variables, namely, interest rate, inflation rate, gross domestic product, foreign exchange reserves, interest rates of the United States with the stock market index of India viz the Bombay Stock Exchange from the pre-reform era of liberalization – 1980 to 2019. Various studies in the well-documented literature tried to study the association between macroeconomic variables and the stock market in diverse ways and forms. This paper encapsulates the long-run and short-run dynamics of the relation between the variables, as mentioned above, and the economy's adjustment speed towards a long-run equilibrium with the ARDL model's help. The empirical analysis displays a strong relationship between India's stock market and India's interest rates and that of the United States, the Gross Domestic Product of India, and its foreign exchange reserves. Further, it shows a negative and significant long term adjustment Coefficient.

**JEL Code Classification:** E44, G10

**Keywords:** Macroeconomic Variables, Stock Market Return, ARDL, Cointergration

## I. INTRODUCTION

The financial market plays a vital role in the modern economy since it acts as a mediator between lenders and borrowers. Financial markets, especially stock markets, have contributed considerably to the development of emerging economies such as India over the last two decades. Stock markets play this role in an economy's growth by providing capital requirements to the industries, participate in the distribution of wealth of the nation by widening the ownership of industries through the issue of stocks to the public, mobilize savings and reduce the cost and risk of producing goods and services. Thus, the market's strength can significantly impact the

  

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economy through its effect on real economic activities. Simultaneously, a shock may lead to market collapse, resulting in significant disturbances in living standards.

An efficient and well-functioning stock market facilitates the growth and development process in an economy by (1) Enhancement of household saving, (2) Optimal allocation of resources for investment, and (3) Attracting foreign portfolio investment.

The stock market encourages households to save and invest in financial instruments on the one hand. On the other hand, it provides easy financing to firms with long-term capital for investment projects. The stock market thus channels funds from savers to investors with higher efficiency. Similarly, a well-established equity market attracts foreign investors. Foreign portfolio investment inflows raise share prices and reduce capital costs to the domestic country's corporations by lowering the price-earnings ratio.

Moreover, an efficient pricing process rewards well-managed and profitable firms by highly valuing their shares. It reduces the cost of capital for such firms. A reduction in capital cost leads to a great and better allocation of resources in the economy and canalization of funds to well-managed and profitable firms instead of unprofitable and unsuccessful firms. Thus, the stock market is the focus of researchers and policymakers because of the perceived benefits it provides the economy. Whether the stock market performance leads or follows economic activity has attracted much attention in the last few years. Almost all the indicators, such as market capitalization, trading volume, total turnover, and the market index, have shown tremendous growth. These developments are often claimed by the authorities to indicate the country's economic progress. In this context, the present study examines whether there are dynamic interactions between stock prices and some essential economic variables, namely Call Money Rate, Gross Domestic Product, Foreign Exchange Reserves, US Interest Rate, and Inflation rate. The study also explores the direction of causation in case a long/short-run association is found. Suppose stock prices and macroeconomic variables are significantly related, and the causation runs from macroeconomic variables to stock prices. In that case,stock market crises can be prevented by controlling fluctuations in macroeconomic variables (specifically, controlling exchange rates and interest rates movements).

Moreover, authorities in developing countries can exploit such a link to attract/stimulate foreign portfolio investment in their own countries by making investment returns in their own country more attractive to foreign investors. Finally, if the stock market and macroeconomic variables are associated, speculators can use this information to predict the stock market's behavior using the information on macroeconomic variables. On the other hand, if the causation runs from the stock market to macroeconomic variables, then the economic activities (and hence economic growth) can be boosted by taking some necessary measures for a stable and well-regulated equity

  

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market. The rest of the strategy of this study is as follows.The second section attempts to explain the links between the stock market and macroeconomic variables. Section three reviews the previous empirical work. Section four outlines the methodology and source of data. Section five describes the findings. Finally, concluding remarks follow in section six.

## II. THE LINK BETWEEN THE STOCK MARKET AND MACROECONOMIC VARIABLES

The role of selected macroeconomic variables and its effect on the performance of the stock market is described below:

### Call money rate:

It is considered a proxy for the interest rate. In monetary policy's daily conduct, it is perhaps the most observed variable in countries like India. It is regularly used to achieve short-run monetary policy objectives. Whenever the call money rate increases, it will negatively affect stock prices for two reasons: Firstly, the higher the interest rate,the higher the cost of capital for the corporate sector and lower the corporate earnings leading to a fall in stock prices. Secondly, the higher the interest rate, the opportunity cost of holding the money increases, thereby causing an exchange of stocks with interest-bearing assets and decreasing the stock prices. Thus, representing opportunity cost, the higher interest rate would motivate investors to reallocate their asset portfolio allocation. Further, it may also increase the cost of borrowing money to purchase shares.

### Gross Domestic Product:

It presents a measure of overall economic activity in the economy and affects stock prices through its influence on expected future cash flow. GDP growth of the underlying economy flows to shareholders in three steps. First, it transforms into corporate profit growth; second, the aggregate earnings growth translates into earnings per share (EPS) growth, and finally, EPS growth translates into stock price increases, further, by enhancing the firm's present value, leading to more retail investors in the stock market, which would lead to a rise in stock prices.

### Foreign exchange reserves:

The monetary authorities' ability to restrain fluctuations in the balance of payments depends upon the country's foreign exchange reserves regardless of foreign exchange rate regimes. Thus, an increase in the reserves will positively affect the stock market for three reasons. First, it will avoid negative evaluations by financial market participants worldwide, especially in emerging and developing economies. Second, the stock market becomes more receptive to foreign

  

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investment as the economy liberalized with the increase in foreign reserves. Third, rising reserves lower the rate of interest, which causes investment and output to rise. The higher gross investment could signal market participants that companies expect higher sales and earnings for the future. Adequate reserves have other benefits as well. For a net debtor country, periodic repayment of the principal amount to the foreign creditors from the accumulated reserves increases the prospect of easy credit for future needs .

**US interest rate:**

US interest has a bearing on the stock market, especially in emerging markets like India. A rate hike in the US will lead to a stronger dollar and a weaker domestic currency, lower investment returns for foreign investors, and prompting them to sell. Further, firms that have borrowed heavily in dollars in the overseas market may see higher costs on borrowings, leading to a fall in the share prices.

Besides, the hikes will lead to a rise in yields on US treasuries and a stronger dollar, thereby narrowing the rate differential between the US and emerging markets, making domestic bonds less attractive for foreign portfolio investors. On the other hand, when the US Fed cuts its interest rates, the difference between the two countries' interest rates increases, making the emerging markets more attractive for the currency carry trade. A rate cut by the Fed would also mean a greater impetus to growth in the US, which could be positive news for stock markets elsewhere.

**Inflation rate:**

Inflation may affect the stock market index negatively. There are three reasons for this. First, a rise in the inflation rate tends to increase the interest rate, leading to lower equities prices. Second, an increase in the inflation rate may reduce profit margins for particular groups of companies such as public utilities, leading to decreased stock prices. Third, in a competitive economy, inflation raises a firm's production costs, leading to a reduction in expected cash flows and lower corporate revenues and profits. Inflation uncertainty may also influence the discount rate, thus reducing the present value of future corporate cash flows. Moreover, during high inflation, people may be laid off work, which would reduce production. Thus, causing stocks to depreciate.

## III. Literature Review

The literature on the liaison between the stock market and macro variables dates back to 1977 when Kraft and Kraft (1977) studied the relation between the S&P 500 index and money supply& the corporate interest rate in the United States of America. They found a negative association between the index and the money supply. Similarly, Chen(1986) and

  

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Cutler(1988)separately studied the NYSE index concerning inflation, treasury bill rate, long-term interest rate, money supply, stock market volatility. They found a negative inflation link with the index and a positive connection with industrial production. Lamont (2001) studied 13 companies in the USA and found a positive industrial production, real labor income, and negative real consumption growth relation with the stock market. In the following year, Falnnery(2002) studied 17 macro series announcements and established a negative consumer price index, producer price index, and money supply with the NYSE index. Later, in 2005, Giovannini studied six oil companies' relations with the stock market index and its volatility to find a positive relation. Wong (2005) found a negative relation of interest rate and money supply with the S&P 500 index. Martin (2012) focused on the effect, implication, impact, and relationship within the US stock indices- Dow & Jones and S&P 500 and various macro-economic variables between 1982 to 2012 and found a more robust connection of the macro variables with Dow & Jones than S&P 500. Francisco and Lorendana (2016) studied the relationship between the US stock market and relevant macro variables. They found that all the variables show statistically significant relationships with the stock market in line with the previous literature's findings except for the consumer price index.

Studies were also conducted in other countries. For instance, in one such analysis for the United Kingdom, Taylor and Poon (1991)studied industrial production, consumer price index, and long-term interest rate in relation to the LSE index. They found that the long-term interest rate and index of the industrial output are negatively related, while the consumer price index is positively correlated. Similarly, Jung(1996)found a positive relationship between gross domestic product and short-term interest rate and LSE index. On similar grounds, Oyama (1997) examined 17 sectors for a relation between the stock market and money supply, the market interest rate in Zimbabwe to find a positive relationship with interest rate and negative money supply. Ibrahim (1999)investigated the relationship between the KLCL index in Malaysia and foreign reserves and exchange rates to find positive foreign reserves and negative exchange rate. In the same year, Kwon and Shinin South Korea found positive trade balance, foreign exchange, and industrial production with the stock market. Madsen (2002) studied 18 OECD countries and found negative inflation and positive gross domestic product relation with their stock market. Dritsaki (2004) checked the ASE index (Athens) relationship with inflation, interest rate, and industrial production and discovered a negative interest rate and inflation while a positive industrial production. Gan et al.(2006)studied the New Zealand stock market index concerning interest rate, money supply, and GDP to find a negative interest rate, money supply, and positive GDP. Celebi&Hönig (2019)studied the impact of macro-economic factors on the German stock exchange for the pre and post-crisis period and discovered a delayed effect of several macro-economic variables on the returns.

  

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Researchers have endeavored to study and predict the relationship between macroeconomic variables and India's stock market movements. These are few pieces of research among the many that were carried out in India. Pethe&Karnik(2000)studied the alliance between Sensex and nifty with the exchange rate to find a negative relation. In contrast, Bhattacharya and Mukherjee(2002)established a positive link between industrial production and a negative inflation rate with Sensex. Singh (2010)revealed a bidirectional relationship between BSE Sensex and the industrial output index, while the wholesale price index and the market were related unidirectionally. Chowan& Shukla (2000), Sahu&Dhiman (2011)found no causal relationship between BSE Sensex and real GDP in India with the correlation and the Granger causality technique. Pal and Mittal's (2011)analysis revealed no long-run relationship of the stock market with the macroeconomic variables with the help of the Johansen Cointegration test.

Ray (2012)examined the relationship between Sensex and interest rate, output, money supply, inflation rate, and exchange rate. Out of which inflation and interest rate were negatively related, and the rest all were positive. Makan et al. (2012) tried to test the stock market's influence with macro variables. They found that exchange rate, FII, and call rate influence the stock market where FII and Sensex share a positive relationship while the others share negative returns. Venkatraja (2014) revealed in his study that 82% of the variation in the Sensex could be explained by economic output, foreign institutional investment, inflation, gold price, and exchange rate. According to his study, the wholesale price index, industrial production index, foreign institutional investment, and real exchange rate influence the BSE index positively to a higher degree. Sensex is influenced inversely by the gold prices. Kaur and Bhatia (2015) studied the impact of macroeconomic variables on the functioning of the manufacturing firms of the BSE 500. Their study revealed that there was no relationship between the variables during the study period. In another study, Kaur (2016) analysed the impact of ten macroeconomic variables on one Indian stock market index-the BSE. This study also revealed that the Indian stock market is weak-form efficient because no relationship was found among the study period variables.

Megaravalli and Gabriele(2017) studied the macroeconomic indicators and their impact on three ASIAN (India, China & Japan) stock markets from 2008 to 2016. They found that inflation has a negative and insignificant long-term effect and that in the short run, there is no significant relationship between the stock market and macroeconomic variables. In another study, Das and Megaravalli (2017) inspected the relationship between the selected macroeconomic variables and the Indian stock market by taking quarterly observations from April 2005 to March 2015. They found that a positive correlation existed between macroeconomic variables and the NIFTY 50 Index. Besides, the Granger causality test revealed that causality ran from the NIFTY 50 Index to the exchange rate and call money rate to the NIFTY 50 Index. Sarika and Bharti (2019)

  

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evaluated the impact of macroeconomic variables on the Indian stock market and a change in net macroeconomic variables such as disposable income, inflation. The exchange rate has a statistically insignificant effect on share prices, whereas share price movements are minor to explain part of the macroeconomic variables' changes.

The brief foregone survey of the literature shows no unanimity between the stock market's relationship with various macroeconomic variables. The findings of multiple studies vary at large. These differences could be accorded to different methodologies used, numerous sets of variables, and different individual research periods. Hence, a contemporary study needs to be conducted to study the dynamics of the variable's impact on India's stock markets. It is in this context that the present study aims to investigate the short term as well as the long term relationship between the stock market of India and selected macro-economic variables –call money rate, gross domestic product, inflation, foreign exchange reserves, and US federal fund rate (interest rate).

## IV. DATA SOURCE AND METHODOLOGY

### Data source:

To accomplish the research objective, annual data ranging from January 1980 to December 2019 of the Bombay stock exchange contains 39 data points for the analysis. Sensex index, which is the benchmark index of the Bombay stock exchange, is used to represent the Indian stock market, and the data was collected from the official website of BSE. The data of other variables included in the study, i.e., call money rate, gross domestic product, foreign exchange reserves, the federal interest rate of United States, and the Wholesale price index, were collected from the handbook of statistics published by the Reserve bank of India.

### Methodology:

To assess the relationship between stock market returns and the selected macroeconomic variables, viz., call money rate, gross domestic product, foreign exchange reserves, the US interest rate, and inflation rate, the present study employs Autoregressive Distributed Lag (ARDL) model. The model in its basic form:

$$Y_t = \beta_0 + \beta_0 y_{t-1} + \ldots\ldots + \beta_p y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \ldots\ldots\ldots + \alpha_q x_{t-q} + \varepsilon_t \qquad \text{eq(1)}$$

here $\varepsilon_t$ is a random 'disturbance' term.

The model is autoregressive because $y_t$ is explained partially by lagged values of itself. It has a distributed lag in the form of successive lags of the explanatory variable 'x'.Often, the current value of $x_t$ is excluded from the distributed lag part of the model's structure.

  

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So the general model is ARDL (p,q), where p is the lag value of the dependent variable, and q is the lag value of regressors. Previous literature has used the ordinary least square (OLS) estimates to study the relationship between the variables, but it does not provide an accurate estimation. The OLS estimates give a biased coefficient estimate because of the dependent variable's lagged values as a regressor. If the error term (disturbance term) $\varepsilon_t$ is autocorrelated, OLS will also be inconsistent. Therefore, to present a better insight into the relationship between the variables, the autoregressive distributed lag model is used in the study. Besides, the ARDL model is preferred for this analysis as it can be used with a mixture of I(0) and I(1) integration, and the present data has a combination of both the integration level. Therefore, the Augmented Dickey-Fuller (ADF) test is applied for unit root to check the macroeconomic and stock market variables to avoid spurious regression.

**The Model**

The ARDL model regresses stock index (dependent) variable on their own lagged value; on stationary (short-run) contemporary and lagged values of macroeconomic (independent) variables; and on non-stationary (long-run) values of macroeconomic variables.

The equation used for testing the long run relationship is modeled as below:

$$\Delta(ssx)_t=\beta_0+\beta_1(ssx)_{t-1}+\beta_2(cmr)_{t-1}+\beta_3(gdp)_{t-1}+\beta_4(fer)_{t-1}+\beta_5(usir)_{t-1}+\beta_6(wpi)_{t-1}$$
$$+\sum_{i=1}^{p}\beta_9\Delta(ssx)_{t-i}+\sum_{i=1}^{q}\beta_{10}\Delta(cmr)_{t-i}+\sum_{i=1}^{r}\beta_{11}\Delta(gdp)_{t-i}+\sum_{i=1}^{s}\beta_{12}\Delta(fer)_{t-i}+$$
$$\sum_{i=1}^{t}\beta_{13}\Delta(usir)_{t-i}+\sum_{i=1}^{u}\beta_{14}\Delta(wpi)_{t-i}+ \qquad \text{eq(2)}$$

After the regression, the Wald test (F-statistic) is computed to differentiate the long-run relationship between the concerned variables.

Further, the ECM version of modified ARDL is used to investigate the short-run dynamic relationships. The lagged value of the first difference of Sensex, call money rate, gross domestic product, foreign exchange reserves, US interest rate, inflation rate, on lagged values is our explanatory variable of Sensex with the error correction variable at first difference as follow.

$$\Delta(ssx)_t=\beta_0+\sum_{i=1}^{p}\beta_9\Delta(ssx)_{t-i}+\sum_{i=1}^{q}\beta_{10}\Delta(cmr)_{t-i}+\sum_{i=1}^{r}\beta_{11}\Delta(gdp)_{t-i}+\sum_{i=1}^{s}\beta_{12}\Delta(fer)_{t-i}+$$
$$\sum_{i=1}^{t}\beta_{13}\Delta(usir)_{t-i}+\sum_{i=1}^{u}\beta_{14}\Delta(wpi)_{t-i}+ECT_{t-1} \qquad \text{eq(3)}$$

While the stationary contemporaneous and lagged values will determine the short-run relationship between macroeconomic variables and stock returns, the non- stationary ones will establish the long-run relationship.

To check the diagnostic of the model, the study uses the following test:

  

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- CUSUM test for checking the stability of the model.
- Breusch-Godfrey Serial Correlation Lagrange Multiplier test to check for autocorrelation errors in the model
- Breusch-Pagan-Godfrey test for testing heteroscedasticity in the model.

## V. RESULTS

### V.1 Descriptive Statistics

The result of the Descriptive analysis of all the variables is presented in table 1 below.

**Table 1: Descriptive Analysis of all the variables included in the study.**

| Descriptive statistics | Sensex | Call money rate | Foreign exchange reserves | Gross domestic product | US - interest rate | Wholesale price index |
|---|---|---|---|---|---|---|
| Mean | 9112.93 | 8.63 | 690594 | 4305830 | 4.554 | 147.95 |
| Skewness | 1.18 | 1.62 | 1.169 | 1.46 | -0.004 | 1.51 |
| Kurtosis | 0.22 | 3.16 | 0.113 | 1.13 | -1.298 | 1.79 |
| Jarque-Bera | 2.933** | 7.549* | 7.202** | 0.318** | 0.392** | 141.942* |

*Author's estimation*

*Note - ** shows significance higher than 40 %*

** shows significance at 5%*

The value of descriptive statistics, including mean, skewness, kurtosis, and normality test (Jarque-Bera), is estimated for stock market proxy variable Sensex and macroeconomic variables such as interest foreign exchange reserves, gross domestic product, US – Interest rate, and inflation rate. The null hypothesis of the Jarque-Berastates that the series does not follow a normal distribution; while, the alternative states that the series follows a normal distribution.

Sensex's mean value is 9112.93 with standard skewness, but fat tails and the normality test (Jarque-bera) shows that the series is not normally distributed. Since the values are more on the tails, it signifies a higher probability of either a boom or a bust. In the call money market or the interest rate, the mean value is 8.63%, highly positively skewed with a standard kurtosis, and follows a normal distribution.

The distribution of the foreign exchange reserves is not normally distributed. It is positively skewed and heavy tails. Similarly, the gross domestic product and wholesale price index are also

  

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highly positively skewed with non-normal distribution with more spread on their tails. Whereas the US – interest rates are moderately negatively skewed with thin tails.

### V.2 Augmented Dickey Fuller (ADF)Test

The variables then are tested for stationarity with the ADF test's help, and their integration levels were determined, which are represented in the table below.

**Table 2: Augmented Dickey Fuller test**

| Level of Integration | Sensex | Call money market | Forex reserves | GDP | US-Interest rates | WPI |
|---|---|---|---|---|---|---|
| I(0) – Level | 3.166 | -2.969* | 4.631 | 2.362 | -2.192 | -3.855* |
| I(1) – First difference | -7.844* | - | -3.797* | -5.299* | -5.927* | - |

*Author's estimation*

*Note - * shows significance at 5%*

The integration levels of all the macroeconomic variables and stock market variables were integrated at the first level. In contrast, the call money market and wholesale price index were integrated at a level. Additionally, it integrates the short-run impact of the given variables with a long-run equilibrium using an error correction term without dropping any long-run information. Therefore, both short-run and long-run relationships between macroeconomic variables and stock market returns for India's stock exchange – BSE Sensex can be assessed through this model.

### V.3 The ARDL model

The model developed follows ARDL(3, 2, 4, 3, 4, 4), and the criterion used for selecting the model is the Hannan-Quinn criterion (HQ). In the model, the dependent variable has three lags. The regressors in the model – call money rate has two lags, foreign exchange reserves have four lags, the gross domestic product has three lags, the US – interest rate has four lags, and the wholesale price index has four lags. Most of the model's regressors are statistically significant, which can be seen in table 4,and the r-square value is also very high, confirming the best fit of the model. The F-test is conducted to verify the short-run and the long-run relations between the variables, shown in table 3. The value of the F- statistics is 29.096. In the table, I(0) represent the lower bound, and I(1) illustrate the upper bounds for the null hypothesis, which states that there is no level relationship between the stock market and the selected macroeconomic variables in the Co-integrated Error Correction Model. The relevant critical value bounds for this test at the 95% level are 2.804 (lower bound) and 4.013 (upper bound). Since the F statistic for both

  

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exceeds the critical value band's upper bound, the null hypothesis of no levels relationship between dependent and independent variables is rejected. Thus, the test results suggest the existence of a long-run relationship between the stock market returns and the chosen macroeconomic variables.

**Table 3: F-Bound Test**

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| F-statistic | 29.10 | 10% | 2.33 | 3.42 |
| | | 5% | 2.8 | 4.01 |
| | | 1% | 3.9 | 5.42 |

*Author's estimation*

After establishing a long-run relationship between the chosen variables with bounds tests' help, the following analysis will constitute a long-run equation.

**Table 4: The ARDL model**

| Conditional Error Correction Regression | | Levels Equation | |
|---|---|---|---|
| Variable | Coefficient | Variable | Coefficient |
| Constant | -27.39184* | LCMR | 0.184661** |
| LBSE(-1) | -2.516924* | LFORX | 0.14202* |
| LCMR(-1) | 0.464779** | LGDP | 1.033858* |
| LFORX(-1) | 0.357453* | LUSIR | 0.33233* |
| LGDP(-1) | 2.602143* | LWPI | 0.075877*** |
| LUSIR(-1) | 0.836451* | Constant | -10.88306* |
| LWPI(-1) | 0.190976*** | CointEq(-1)* | -2.516924* |
| R-squared | 0.98623 | Durbin-Watson stat | 2.13474 |

*Author's estimation*

*Note - *** shows significance higher than 40 %*

*** shows significance higher than 10 %*

** shows significance at 5%*

  

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According to the long-run coefficient specified in the levels equation in table 4, it is evident that foreign exchange reserves, gross domestic product, and the US- interest rates are significant at a five percent level of significance, indicating the existence of a long-run relationship between stock market returns and foreign exchange reserves, gross domestic product and US- interest rates. The call money market rate coefficient is significant at a ten percent level of significance, confirming a long-run relationship with the stock market. However, the wholesale price index seems not to influence the stock market in the long run since it is not significant.

In the short run, as specified in the table, the short-run coefficient estimates show the dynamic adjustment of all variables. The short-run coefficient of the lagged values of Sensex, foreign exchange, gross domestic product, and US interest rates are statistically significant at 5% level significance. The lagged value of the call money market is found significant at 10 percent significance. This signifies that the stock market, the foreign exchange reserves, the gross domestic product, and the United States' interest rates are affected by their first lags in the short run. In contrast, India's first lag of call money rate is significant, verifying its importance in influencing the stock market.

The ECM coefficient λ, i.e., CointEq(-1), is statistically significant and negative, implying convergence to equilibrium in the model. Furthermore, the presence of a significant coefficient of the Error Correction Model confirms a stable long-run relationship and cointegration between the independent and dependent variables. The value of λ is equal to $\lambda = -2.52$. It implies that the dependent variable, i.e., stock market returns, will return aftershock in an independent (macroeconomic) variable in log run at a 250% speed per year.

## VI. CONCLUSION

The study investigated the relationship between stock market return in terms of proxy chosen as Bombay stock exchange's broad market index Sensex and selected macro-economic variables of India – call money rate (interest rate), gross domestic product, foreign exchange reserves, interest rates of the United States, and wholesale price index(inflation rate) using the ARDL model. The ARDL model results indicate a long-run relationship between the Sensex and the call money rate (interest rate) of India and the United States of America, India's gross domestic product, and Indian foreign exchange at various levels of significance. In the short run, the relationship between the stock market and the gross domestic product, the United States interest rate, and the wholesale price index is significant. In contrast, Indian interest rates and foreign exchange reserves of the current period do not impact the stock market. This implies that a positive change in gross domestic product would positively impact the stock market. However, as expected,the United States interest rate and inflation rate negatively affect the stock market index.

  

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Further, the study also indicates the depth of the stock market activities through the speed of adjustments towards the long-run equilibrium by estimating the error term, which is found to be negative and highly significant. The rate of adjustment is 250% between short-run dynamics and long-run equilibrium values. It is the rate at which the market will adjust to changing economic circumstances.

These findings would augment the investor's portfolio knowledge and assessment regarding the stock market's sensitivity to any change in the macroeconomic variables. Moreover, it would bolster the portfolio manager's ability to make significant investment decisions by providing them with enhanced insight into portfolio selection, macroeconomic risk, country risk, risk-return relationship, and diversification of risk corresponding to the country the world. These estimations will also benefit the policymakers and regulators to formulate appropriate monetary and fiscal policy stances and shield the Indian market against global risk regarding foreign exchange and interest rates.

**REFERENCES**

Bhattacharya, B. and Mukherjee, J. (2002), "The Nature of the Causal Relationship between Stock market and macroeconomic aggregates in India: An Empirical Analysis," paper presented at Capital Market Conference. retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.467.4248&rep=rep1&type=pdf

Bhuvenshwari, D. and Ramya, K. (2018). "Can Select Macroeconomic Variables Explain Long-Run Price Movements of Indian Stock Indices?", 5 (1),35-53, https://doi.org/ 10.17010/ijrcm/2018/v5/i1/122907

Das, A. and Megaravalli, A. V. (2017), "Macroeconomic Indicators and Stock Market Boogie: The Case of National Stock Exchange, India", 4 (3), 20-32, https://doi.org/ 10.17010/ijrcm/2017/v4/i3/118913

Dritsaki-Bargiota, M. &Dritsaki, C. (2004),"Macroeconomic determinants of stock price movements: An Empirical investigation of the Greek stock market", XI International Conference. Multinational Finance Society, Istanbul, July 3-8.

Celebi, K., &Hönig, M. (2019), "The Impact of Macroeconomic Factors on the German Stock Market: Evidence for the Crisis, Pre- and Post-Crisis Periods", International Journal of Financial Studies, 7(2), 18. https://doi.org/10.3390/ijfs7020018

  

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Chen, N., Roll, R., and Ross, S., (1986), "Economic Forces and the Stock Market" The Journal of Business, 59(3), 383- 403.

Chowan, P.K., and Shukla. V, (2000), "Volatility in Indian Stock Markets", Xavier Institute of Management. Retrieved from https://www.academia.edu/7933308/Volatility_in_Indian_Stock_Markets

Cutler, D., Poterba, J., & Summers, L., (1988), "What Moves Stock Prices?", NBER Working Paper 2538, The Journal of Portfolio Management, 15(3), 4-12

Flannery, M., &Protopapadakis, A., (2002), "Macroeconomic Factors do Influence Aggregate Stock Returns", The Review of Financial Studies, 15(3), 751 -782.

Gan, C., Lee, M., Yong, H., & Zhang, J.,(2006), "Macroeconomic Variables and Stock Market interactions: New Zealand evidence", Investment Management and Financial Innovations, 3(4), 89-101.

Ibrahim, M.H., (1999), "Macroeconomic Variables and Stock Prices in Malaysia: An Empirical Analysis", Asian Economic Journal, 13(2), 219-231.

Jareno, F., &Negrut, L., (2016), "US Stock Market and Macroeconomic factors", The Journal of Applied Business Research, 23(1), 325-340

Jung, C., & Boyd, R., (1996), "Forecasting UK Stock Prices", Applied Financial Economics, 6,279-286.

Kaur,G., (2016), "Relevance of Macroeconomic Variables in the Indian Stock Market",Indian Journal of Research in Capital Markets,3(1), 47-62

Kaur, G., and Bhatia, B.S., (2015), "An Impact of Macroeconomic Variables on the functioning of Indian Stock Market: A Study of Manufacturing Firms of BSE 500", Journal of Stock & Forex Trading, 05(01). https://doi.org/10.4172/2168-9458.1000160

Keshwani, S., & Wadhwa, B., (2019), "Evaluating the impact of Macroeconomic Variable on Indian stock market", International Journal of Engineering and Advanced Technology, 8(6), 4427-4434, ISSN: 2249-8958.

Kraft, J.,& Kraft, A., (1977), "Determinants of Common Stock Prices: A Time Series Analysis", The Journal of Finance, 32(2), 417-425.

ISSN: 2455-8834

Volume:05, Issue:11 "November 2020"

Kwon, C & Shin, T (1999), "Cointegration and causality between Macroeconomic Variables and Stock Market Returns", Global Finance Journal, 10(1), 71-81, ISSN 1044-0283, https://doi.org/10.1016/S1044-0283(99)00006-X.

Lamont,O., (2001), "Economic Tracking Portfolios", Journal of Econometrics, 105,161-184.

Lanza, A., Manera, M., Grasso, M., &Giovannini, M., (2005), "Long-run models of oil stock prices", Environmental Modelling & Software, 20, 1423–1430.

Madsen, J.B., (2002), "Equity Prices, Share Price Valuation, Crashes and Depressions" Journal of the Danish Economic Society, 141,3-34.

Makan, C., Ahuja, A.K., & Chauhan, S. (2012), "A study of the effect of macroeconomic variables on stock market: Indian perspective", Munich Personal RePEc Archive,doi http://mpra.ub.uni-muenchen.de/43313/

Megaravalli, A. and Gabriele, S. (2018),"Macroeconomic indicators and their impact on stock markets in ASIAN 3: A pooled mean group approach", Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, 6(1),1-14.

Oyama, T., (1997), "Determinants of Stock Prices: The case of Zimbabwe", IMF working paper.

Pal, K., & Mittal, R. (2011),"Impact of macroeconomic indicators on Indian capital markets". Journal of Risk Finance, 12(2), 84-97.

Pethe, A., &Karnik, A. (2000b),"Do Indian Stock Markets Matter?", Economic and Political Weekly, 35(5), 349–356.

Ray, S., (2012), "Testing Granger causal relationship between macroeconomic variables and stock price behaviour: Evidence from India", Advances in Applied Economics and Finance, 3(1), 470-481.

Sahu, N. C., & Dhiman, H. D. (2011),"Correlation and causality between stock market and macro-economic variables in India: An Empirical Study", International Conference on E-business, Management and Economics, Hong Kong: IACSIT Press

Singh, D. (2010),"Causal Relationship between Macroeconomic Variables and Stock Market: A Case Study for India", Pakistan Journal of Social Sciences 30, 263-274.

Sirucek, M., (2012), "Macroeconomic variables and stock market: US review", InternationalJournal of Computer Science and Management Studies retrieved from https://mpra.ub.uni-muenchen.de/39094/

ISSN: 2455-8834

Volume:05, Issue:11 "November 2020"

Taylor, S.J.,& Poon, S., (1991), "Macroeconomic factors and the UK stock market". Journal of Business Finance and Accounting, 18 (5), 619-636.

Venkatraj, B. (2014), "Impact of Macroeconomic variables on Stock market performance in India: An empirical analysis", International Journal of Business Quantitative Economics and Applied Management Research, 1(6), 107-142.

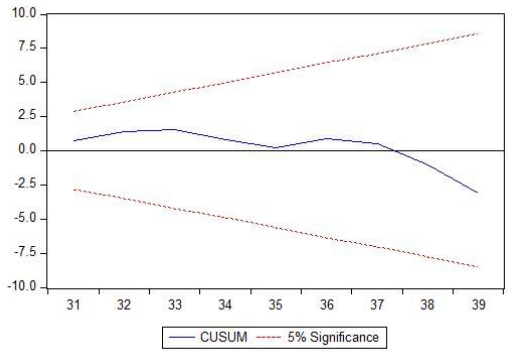
Wong, Wing-Keung. Khan, Habibullah and Du, Jun.(2005), "Money, Interest Rate, and Stock Prices: New Evidence from Singapore and the United States", U21Global Working Paper No. 007/200, Retrieved from http://dx.doi.org/10.2139/ssrn.1607605

**APPENDIX**

**Diagnostic Checking:**

1. CUSUM TEST –

Figure 1: CUSUM TEST




As it is clear from the above fig, the plots of the CUSUM test within the boundaries and hence these statistics confirm the stability of the long run coefficient of regressors.

2. Breusch-Godfrey Serial Correlation Lagrange Multiplier test to check for autocorrelation errors in the model

Table 5: Serial Correlation Test

| **Breusch-Godfrey Serial Correlation LM Test:** | | | |
|---|---|---|---|
| **F-statistic** | 0.151422 | Prob. F(2,7) | 0.8622 |

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| | | | |
|---|---|---|---|
| **Obs*R-squared** | 1.451423 | Prob. Chi-Square(2) | 0.484 |

*Author's estimation*

The null hypothesis of Breusch-Godfrey Serial Correlation test states that there is no serial autocorrelation in the model. Since the probability of the f-statistics of the model is great than 5% significance level the null hypothesis is accepted and there is no serial autocorrelation found in the ARDL model.

3. Breusch-Pagan-Godfrey test for heteroscedasticity

Table 6: Heteroscedasticity Test

| **Heteroscedasticity Test: Breusch-Pagan-Godfrey** | | | |
|---|---|---|---|
| **F-statistic** | 1.388052 | Prob. F(25,9) | 0.3141 |
| **Obs*R-squared** | 27.79198 | Prob. Chi-Square(25) | 0.3175 |

*Author's estimation*

The null hypothesis of Breusch-Pagan-Godfrey Heteroscedasticity test states that there is same variance in the model. The probability value of the f-statistics is greater than 0.05 i.e. greater than 5% level of significance. Thus in this case the null hypothesis is accepted for no heteroscedasticity in the ARDL model.

  