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Sensitivity of stock markets to macroeconomic fundamentals in India

Dr. Jasvir S Sura

Assistant Professor, Department of Management, Chaudhary Ranbir Singh University, Jind, Haryana, India

Abstract

Stock indices are the barometer of an economy and are affected by numerous factors like economic condition, listed companies performances, government policies and regulation, sale and purchase transaction in the particular period, arbitrageurs and speculators interferences and many other factors. The present study emphases on certain macroeconomic variables include the exchange rate, foreign reserves, the balance of trade, and inflation using monthly data that span from April 2008 to March 2016. To identify the variables that have high explanatory powers, multiple regression models are applied and concluded that the exchange rate is the main predictor for causing the variations among all predictors. Other variables like foreign reserves, trade balances, inflation rate and interest rate are having a very low insignificant impact on the return of stock indices.

Keywords: Macroeconomic variables, Sensex, Nifty, ADF, India

Introduction

Nowadays, the stock market has become an important driver of the modern market-based economy and is one of the major sources of raising resources for Indian corporate that enabling financial and economic development. Any movement in the stock market is explained by numerous factors like economic condition, listed companies performances, government policies and regulation, sale and purchase transaction in the particular period, arbitrageurs and speculators interferences and many other factors. A number of domestic and international factors directly or indirectly affects the stock market. The factors are divided into two categories macroeconomic factors and fundamental factors. Fundamental factors include corporate performance, industrial growth etc. exert a certain amount of influence on the stock markets. On the other hand, macroeconomic variables include interest rate, inflation, exchange rate, index of industrial production, money supply, gold price, silver price and oil price, credit deposit ratio, and fiscal deficit etc. The present study emphases on certain macroeconomic variables include the exchange rate, foreign reserves, the balance of trade, and inflation using monthly data that span from April 2008 to March 2016.

The study is organized in four sections as the part one presents a survey of the existing literature; part two presents the data descriptions and variables undertaken for the study; part three presents research methodology to be employed for investigation and analysis the objectives, and part four reports the empirical findings and conclusion.

Survey of Existing Literature

In the past decades, many academicians, industry researchers, financial analysts, and practitioners have attempted to predict the relationship of stock markets movement and macroeconomic variables. They have conducted numerous studies to examine the relationship between the two and the results of studies have provided different conclusions according to the combination of variables, methodologies, and tests used. Here, we have discussed some previous research works/papers and their empirical findings which are related present study.

Kumar, (2008) examined the relationship between macroeconomic variables and the stock market in India during the period of 1998- 2008. ARIMA model was used to establish a long- term relationship between stock prices and macroeconomic variables and concluded that there is no cointegration between sensex and Inflation. Similarly, the sensex and the Dollar exchange rate are not related to each other.

Erbaykal, Okuyan, and Kadioglu, (2008) [12] investigated the relationship between real macroeconomic variables and stock prices in Turkey under “Proxy hypothesis” developed by Fama (1981) during the period 1987- 2006. They find that there is a positive relationship between the real macroeconomic variables and stock prices. It means that an increase in the real economic activities affects the inflation negatively; and because of the negative relationship between the inflation and stock prices, stock prices will be affected positively.

Cutler, Poterba and Summers, (1989) [10] find that Industrial Production growth is significantly positively correlated with real stock returns over the period 1926-1986, but not in the 1946- 85 sub-period.

Bhattacharya and Mukherjee (2002) studied the nature of the causal relationship between stock prices and macro aggregates for the period of 1992-93 to 2000- 2001.Their results show that there is no causal relationship between stock price and macroeconomic variables like money supply, national income, and interest rate but there exists a two-way causation between stock price and rate of inflation. Their results also indicate the index of industrial production leads the stock price.

Mukherjee and Naka, (1995) [23] argued that a change in the money supply provides information on money demand, which is caused by future output expectations. If the money supply increases, it means that money demand is increasing, which, in effect, signals an increase in economic activity. Higher economic activity implies higher cash flows, which causes stock prices to rise.

Bernanke and Kuttner, (2005) [5] argue that the price of a stock is a function of its monetary value and the perceived risk in holding the stock. A stock is attractive if the monetary value it bears is high. On the other hand, a stock is unattractive if the perceived risk is high. The authors argue that the money supply affects the stock market through its effect on both the monetary value and the perceived risk. Money supply affects the monetary value of a stock through its effect on the interest rate. The authors believe that tightening the money supply raises the real interest rate. An increase in the interest rate would, in turn, raise the discount rate, which would decrease the value of the stock as argued by the real activity theorists.

Dornbusch and Fischer, (1980) [11] suggest that changes in exchange rates affect the competitiveness of a firm as fluctuations in exchange rate affects the value of the earnings and cost of its funds as many companies borrow in foreign currencies to fund their operations and hence its stock price. Furthermore, movements in stock prices may influence exchange rates and money demand because investors' wealth and liquidity demand could depend on the performance of the stock market.

Gay, (2008) investigated the time-series relationship between stock market index prices and the macroeconomic variables of the exchange rate and oil price for Brazil, Russia, India, and China (BRIC) using the Box-Jenkins ARIMA model. No significant relationship was found between respective exchange rate and oil price on the stock market index prices of either BRIC country, this may be due to the influence other domestic and international macroeconomic factors on stock market returns, warranting further research. Also, there was no significant relationship found between the present and past stock market returns, suggesting the markets of Brazil, Russia, India, and China exhibit the weak form of market efficiency.

Ramcharran and Kim, (2008) [28] investigated the impact of Financial Liberalization on Equity Returns in Southeast Asian Markets during the period (1991-2000). They analyzed six Asian equity markets (Korea, Philippines, Taiwan, Indonesia, Malaysia, and Thailand) using a dynamic adjustment Model with three independent variables: market capitalization value, price book value ratio and find that the coefficients are negative and very small. The negative sign suggests that liberalization, resulting from increased stock market sizes and diversification opportunities, has reduced risk and thus the rate of return (consistent with finance theory).

Liu and Shrestha, (2008) [21] analyzed the long-term relationship between macroeconomic variables and the Chinese stock market during the period from January 1992 to December 2001 with a sample size of 120 observations. They found that the long-term relationship does exist between the stock market and the macroeconomic variables. While the IP and MS are positively related to the stock prices, inflation, interest rate and currency value are negatively related to the stock prices.

Liow, Ibrahim, and Huang, (2006) [17, 18] analyzed the relationship between expected risk premium on property stocks and some major macroeconomic risk factors of four major markets, namely, Singapore, Hong Kong, Japan and the UK by using GMM Model. They found that excess stock return of Hongkong was positively related to GDP, INDP, Inflation and rate and negatively related with Interest rate and money supply. In UK economy all five factors are negatively correlated and inJapan all these factors are positively correlated and In Singapore INDP is positive and GDP, Unexpected Inflation, and Exchange rate are negatively correlated.

Coleman and Tettey, (2008) [20] examined the impact of macroeconomic variables on the performance of stock markets during the period 1991-2005. They examined that Inflation rate and Lending rate are negatively related and Treasury bill rate is positively related to stock performance and there is no impact of Exchange rate on stock performance.

Chandra, (2012) [9] examined the cause and effect relation between foreign institutional investment (FII) trading volume and stock market returns in the Indian context. The study was conducted during the period 1 January 2003 to 28 February 2011. Granger-causality approach was used to investigate the bi-directional causality between net FII trades and returns. NSE S&P CNX NIFTY50 and FII flows in Indian market were used as samples of the study and three different measures of trading volume in the FII category were considered: Daily number of transactions by FIIs (NTRAN), Daily number of shares traded by FIIs (NQNTY) and Daily value of trades by FIIs (NVAL). He concluded that there is a bi-directional relationship between stock returns and FII inflows in Indian stock market.

Black, Macmillan, and Macmillan, (2015) [6] investigated the link between stock prices and macroeconomic variables. They conducted their study in 29 major markets in the world. The results of the study showed that there is the existence of a long-run cointegrating relationship between stock prices, dividends, Output, and consumption.

Gupta and Reid, (2013) [15] examined the sensitivity of macro-economic surprises (Monetary policy and macroeconomic news) and stock return in the South African context. Ten stock market indices are considered as the dependent variables. They concluded that with the exception of the gold mining index, where the CPI surprise plays a significant role, monetary surprise is the only variable that consistently negatively affects the stock returns significantly, both at the aggregate and Sectoral levels and the PPI, CPI and REPO surprises have the largest effect on the stock returns, followed by the CA and GDP surprises.

Adams, McQueen and Wood, (2004) examined the impact of Inflation news on high-frequency stock returns. In their study, they included Producer Price Index (PPI) and Consumer Price Index (CPI) announcements as indicators affecting stock return. They concluded that there is a strong negative correlation between stock returns and inflation surprises and unexpected increases in both the PPI and the CPI cause stock prices to fall.

Thorbecke and Coppock, (1996) [33] examined the response of stock return to monetary policy shocks and other macroeconomic variables during the period September1974-September 1979 and October1982-October1987 in New York. They concluded that unexpected changes in Federal Fund Rate(FRR) and Non- Borrowed reserves(NBR) affects the stock return to a great extent. Unexpected tightening of monetary policy produced a decline in stock return to a great extent. Average 32 percent of the variation in stock return is explained by the macroeconomic factors.

He, (2002) [16] identified the major risk factors in the pricing of industrial stocks. The monthly result in the study indicated that excess return of the industrial stock was very sensitive to changes in unsecuritized real estate market proxies by market sales index of new houses sold. The result showed that overall stock market factor is the most stable factor and the real estate factor was a second most stable factor.

Olowe, (2007) [26] examined the dynamic equilibrium relationship between a group of macroeconomic variable and stock return and this study was conducted in Nigerian stock market Index. The results of the study showed that a cointegrating relationship exists among macroeconomic variables. The cointegration relationship is consistent and the exchange rate is negatively correlated with the stock price and Inflation, Money Supply, Oil prices and Interest rate has positively correlated with stock prices.

Nishat, Shaheen, and Hijazi, (2004) [25] examined the relationship between Macroeconomic Factors and the Pakistani Equity Market during the period 1973 to 2002 in Karachi Stock Exchange Index. They found that these five variables are cointegrated and two long-term equilibrium relationships exist among these variables. Analysis of their results indicated that industrial production is the largest positive determinant of Pakistani stock prices and inflation is the largest negative determinant and industrial production is negatively correlated with the stock indices.

Ludvigson and Ng, (2009) [22] examined the role of macroeconomic factors in determining the risk premium on Bonds with monthly data spanning the period January 1964-December 2003 and the observation contained in the study were zero-coupon U.S. Treasury bond prices. They found that there was the presence of strong predictable variation in excess bond returns which was associated with macroeconomic factors. These factors were having substantial predictive power independent not likewise other factors. The predictive power of the estimated factors was not just statistically significant but also economically important, with factors explaining between 21 percent and 26 percent of one-year-ahead excess bond returns. The factors also exhibited stable and strongly statistically significant out-of-sample forecasting power for future returns. The main predictor variables are factors based on real activity that was highly correlated with measures of output and employment, but two inflation factors and a stock market factor also contained information about future bond returns.

Chancharoenchai, Dibooglu, and Mathur, (2005) [8] analyzed the relationship between domestic macroeconomic variables and stock excess returns to evaluate the effects of macroeconomic variables on excess returns prior to the 1997 Asian crisis and this study was based upon the Southeast Asian economies. The results showed that the volatility in these countries' stock markets, the monthly stock excess returns can best be specified by the process of conditional heteroskedasticity, except for Malaysia, before the financial crisis. Specifically, the monthly stock excess returns volatility on the Korean exchange is characterized as the GARCH (1, 1)-M process for both sample periods, whereas other markets are modelled by the GARCH (1, 1) process and various AR processes. In the Indonesian exchange, for instance, the interest rate appears to have had a statistically significant impact on the conditional mean, and the interest rate and January dummy have explanatory power for time-varying volatility before the Asian crisis and there is strong evidence of the significant impact of inflation uncertainty on monthly stock excess returns or on their time-varying variance and there is strong evidence of the significant impact of inflation uncertainty on monthly stock excess returns or on their time-varying variance.

Muradoglu, Taskin, and Bigan, (2000) [24] examined the causal relationship between stock returns and macroeconomic variables in emerging markets during the time period of 1976 – 1997 and nineteen emerging markets were included in their study. The study showed that out of nineteen emerging markets, only twelve exhibit any type of causal relationship with stock returns. In Argentina, interest rates and inflation cause stock returns; and, at the same time, stock returns cause interest rates and inflation and In Mexico, foreign exchange rates and U.S. returns cause stock returns, and stock returns cause interest rates, foreign exchange rates, and industrial production and eight countries besides Argentina and Mexico, they observed unidirectional causality from U.S. returns and macroeconomic variables to stock returns. The study has also shown that the two-way interaction between stock returns and macroeconomic variables is mainly due to the size of the stock markets, and their integration with the world markets, through various measures of financial liberalization.

Sohail and Hussain, (2009) examined the long-run and short-run relationships between Lahore Stock Exchange and macroeconomic variables during the time period of December 2002 to June. The study has shown that two long-run relationships were found between macroeconomic variables and LSE25 Index. In the long-run, inflation had a negative impact on stock prices while Industrial production index, real effective exchange rate, and Money supply affected stock returns positively. However, three months Treasury bills rate showed the insignificant positive impact on stock returns in the long-run. The results of Variance Decomposition illustrated that among the macroeconomic variables, inflation was explaining the maximum variance.

Machado, Congregado, Golpe, and Vega, (2011) [14] investigated the relationship between macroeconomic variables and stock market returns in the Spanish market. Findings of the study indicated that market risk premium is usually positive, periods with negative values appear only in three periods (1991:1-1993:2, 1998:3-2002:2 and from 2007:1-2009:11) leading to changes in the GDP evolution and study showed the presence of structural breaks in the Spanish market risk premium and its relationship with business cycle and financial markets and the impact of the macroeconomic variables such as GDP on the stock and bond return.

Jiranyakul, (2009) [19] examined the relationship between the stock market index and Macroeconomic variables in Thailand. The study explained that there was no existence of long-run relationship between the stock market Index (or stock prices) and the four macroeconomic factors: real GDP (LY), money supply (LM1), nominal effective exchange rate (LEX), and price level (LCPI). Real GDP, nominal Effective exchange rate, and money supply positively influenced stock market index while the Price level negatively influenced the stock market index and The stock market index (LP) was positively related to real GDP, narrow money supply (M1), and nominal effective exchange rate (EX). It was negatively related to the price level (CPI), but the coefficient was not significant.

Sharma and Mahendru, (2010) [31] examined the impact of macroeconomic variables on stock prices in India and study was focused on four major macroeconomic variables which were Gold price, foreign exchange reserves, exchange rate and Inflation. The study revealed that exchange rate, and gold price to affect the entire BSE Stock price. There was 88.9 percent correlation of exchange rate with stock price and gold price has

90.2 percent correlation with stock price. Independent variables except for inflation rate and Foreign exchange reserve have a significant relation with the stock price and Exchange rate and gold price seem to affect the entire stock price while the inflation rate is significant for only three of the twelve portfolios.

Chen, Roll, and Ross, (1986) examined the relationship between economic forces and stock market using factor model during the period January 1953 to November 1983 and concluded that several economic variables were significant in explaining expected stock return likewise IP, change in risk premium, changes in yield curve, measure of unanticipated inflation and changes in expected inflation were highly volatile in explaining stock return.

Gao, Song, and Wang, (2008) [13] tested the rational-expectations hypothesis using data from the Chinese stock market by using discrete or limited independent variable model. Their empirical results rejected the REH (rational-expectations hypothesis) and show that in China's stock market survey forecasts are overly optimistic, especially with positive information, and can be improved slightly using past information.

Hassan, Ahmad, and Anwar, (2014) [29] investigated the Impact of political events on stock Market returns in Pakistani Stock Market during the time period of May 1999 to December 2011 using the mean-adjusted return model and event study methodology and by comparing the market efficiency between the two government styles, i.e. autocratic and democratic and study was applied on Karachi Stock Exchange (KSE) returns and political events from May 1999 to December 2011 was included as major macroeconomic variable and they concluded that KSE was relatively inefficient and it was taking almost 15 days to come to its original position and The market did not respond to all political events and it can be assumed that these events were lesser important.

Ahmed, (2008) [2] investigated the causal relationships between stock prices and the key macroeconomic variables representing real and financial sector of the Indian economy during the period March 1995 to March 2007. The study revealed that there was the presence of a long-run relationship between stock prices and FDI, stock prices and MS and stock prices and IIP and movement in stock prices causes movement in IIP and growth rate of real sector was factored due to the movement of stock prices and the results also showed that FDI does cause movement in stock prices while movement in stock prices does not have significant effect on FDI.

Sharma, Singh, and Singh, (2011) [30] investigated the relationship between Macroeconomic variables and economic performance during the time period 2002 to 2009. The results of the study showed that Granger model and VAR model indicates that CPI, WPI, and Exchange do not have any influence on each other in the case of both of the countries but the Variance decomposition model the shows the visible impact of macroeconomic variables on each other.

Osisanwa and Atanda, (2012) [27] analyzed the variables of the stock market returns in Nigeria by employing the OLS techniques using annual data for the period between 1984 and 2010. The result showed that exchange rate, interest rate, money supply and previous stock return levels are the primary determinants of stock returns in Nigeria.

Ray and Sarkar, (2014) examined the dynamic relationship between the Indian stock market and the macroeconomic variables. They found that the long-run stock market was positively related to exchange rate and output and negatively related to short-term and long-term interest rate, inflation and money supply. The results of the innovation analysis and causality explained that the Indian stock market influences the industrial activities and the markets are expected to be more sensitive to the shocks of the market.

Subburayan and Srinivasan, (2014) [32] investigated the effects of macroeconomic indicators on CNX Bankex return in the Indian stock market by using monthly data for the period from 1st January 2004 to 31st December 2013. They found that interest rate and exchange has significant positive influence on the bank stock returns and there is no causal relationship between interest rate and CNX Bankex, inflation and CNX Bankex. But there are unidirectional causal relations between Bank stock and exchange rate.

Mutuku and Ng'eny, (2015) investigated the dynamic relationship between macroeconomic variables and the stock prices in Kenya by using quarterly data ranging from 1997 to 2010. They found that there is a positive relationship between the stock price and the nominal gross domestic product, nominal exchange rate, and the Treasury bill rate. However, there is a negative relationship between the stock prices and consumer price index in their study.

The researchers like Erbaykal, Okuyan and Kadioglu (2008) [12], Coleman and Tettey, (2008) [20], Olowe, (2011) [3], Thorbecke and Coppock, (1996) [33], Nishat, Shaheen and Hijazi, (2004) [25], Ludvigson and Ng, (2009) [22], Black, Macmillan and Macmillan, (2015) [6], Chancharoenchai, Dibooglu, and Mathur, (2005) [8], Muradoglu, Taskin and Bigan, (2000) [24], Sharma and Mahendru, (2010) [31], Chen, Roll and Ross, (1986) and Ahmed, (2008) [2] reported the positive relationship between stock return and macroeconomic variables and variables included in studies are inflation, output, private consumption, oil prices, interest rate, gold prices, FDI, GDP, industrial production, dividend and treasury bill rates. Further, Adams, Liow, and Huang, (2006) [17, 18], Jiranyakul, (2009) [19], Mcqueen and wood (2004) reported the negative relationship between stock return and macroeconomic variables. The present study contributes to existing literature by providing a robust result, because it is based on more than one statistical technique and studying the impact of macroeconomic variables on the both major stock market (BSE and NSE) of India.

After reviewing the existing literature the impact of macroeconomic variables on stock return seems to be unclear; furthermore, there is a dearth of studies in the Indian context, and some of the macroeconomic factors were also not grossly researched. Moreover, there is not any study comparing the effect of macroeconomic fundamentals on the both of Indian stock market. So, the present study is to invest the impact of macroeconomic fundamental on Indian stock markets.

Sample and Database

NSE's (National Stock Exchange) CNX Nifty and BSE's (Bombay Stock Exchange) Sensex indices are taken as dependent variables and predictor variables are inflation rate**,** exchange rate**,** foreign exchange reserves**,** the balance of trade**,** and interest rate. The reference period for the study is 2008 to 2016 is taken as per the availability of data (total of 96 months). The data is taken from the database maintained by Reserve

Bank of India (RBI), Bombay Stock Exchange (BSE), and National Stock Exchange (NSE) in CSV format.

Statistical Tools

To test whether the financial variables under study are stationary, a unit root test is performed using the Augmented Dickey-Fuller (ADF) methods. The Dickey-Fuller test has been applied to regressions run in the following four forms:

Model

$$I \qquad \Delta Y_t = \delta Y_{t-1} + \mu_t \qquad ----------- 1$$

$$II \qquad \Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu_t \qquad ---------- 2$$

$$III \qquad \Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \mu_t \qquad ---------- 3$$

$$IV \qquad \Delta Y_{\varepsilon} = \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t-1} + \mu_t \qquad ----------- 4$$

Where, Yt = In (Pt) is the natural logarithm of the value of each variable at time t, are the difference operator and t are for a time. In each model, the null hypothesis is that = 0, that is, there is a unit root. The difference of model 1st from the 2nd and 3rd regressions lies in the inclusion of the constant (intercept: drift) and the trend term (Dickey-Fuller, 1979). If the error termµt is autocorrelated, the 3rd model is modified and taken as model-IV. When the DF test statistic is applied to models like (IV), it is called Augmented Dickey-Fuller (ADF) test. Each of the above models has also been applied to pooled data series for each variable. The ADF test statistic has the same asymptotic distribution as the DF statistic, so the same critical values are used.

Descriptive Statistics are used to present quantitative descriptions in a manageable form includes arithmetic mean, standard deviation, skewness, kurtosis are used in present paper.

To identify the macroeconomic variables that have high explanatory powers, multiple regression models are applied. To avoid the problem of multi-co linearity the following step-wise multiple regression equation is used:

$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + \mu$ ……………….. 5

Where, Y = share price index of Nifty, a = constant term, b_1 to b_5 are the regression coefficients for the respective variables, x_1 = exchange rate x_2 = foreign reserves x_3 = trade balances, x_4 =inflation rate, x_5 = interest rate and µ = error term. Here Y (i.e. Share Price Index) is the dependent variable, while the rest x_1 to x_5 are independent variables.

$Y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + \mu$ ……………..6

Where, Y = share price index of Sensex, a = constant term, b_1 to b_5 are the regression coefficients for the respective variables, x_1 = exchange rate x_2 = foreign reserves x_3 = trade balances, x_4 =inflation rate, x_5 = interest rate and µ = error term. Here Y (i.e. Share Price Index) is the dependent variable, while the rest x_1 to x_5 are independent variables.

Results and Discussion

The table-1 presents the results from two well-known tests of normality, namely the Kolmogorov-Smirnov and the Shapiro-Wilk Test. The test statistic of K-S test is denoted by D. As the result shows that most of the variables are insignificant at 5 percent depicts that the data of all these variables is normally distributed. According to S-W test, all the variables are insignificant at 5% significance level which also confirms that variables are normally distributed after Log_{10} transformation.

Table 1: Normality Test of Select Variables

	Kolmogorov-Smirnova			Shapiro-Wilk		
Variables	**D**	**df**	**Sig.**	**D**	**df**	**Sig.**
Nifty	0.084	95	0.092	0.062	95	0.067
Sensex	0.071	95	0.200	0.056	95	0.058
Exchange Rate	0.061	95	0. 200	0.073	95	0.074
Foreign Reserves	0.08	95	0.166	0.056	95	0.073
Trade Balances	0.085	95	0.084	0.971	95	0.084
Inflation Rate	0.084	95	0074	0.040	95	0.091
Interest Rate	0.071	95	0.198	0.087	95	0.102

Table-2 presents the result of DF- test at level (P_1) and the unit root of DF statistics at the 1st difference. In simple words, if the tau value is greater than t-value null hypothesis is rejected means that time series is a stationary. The table shows that Nifty tau value is more than t-value in the case of the unit root without drift which means that the null hypothesis is rejected but in the cases of the unit root without drift and unit root with drift and trend, the null hypothesis is accepted. Other variables also depict the same result. So, we can say that data is stationary in the case of the unit root without drift.

Table 2: Augmented Dickey-Fuller Test

Equation	**D.F Statistic at level**			**Unit Root of D.F Statistics at 1st Difference**		
	In (P_t)			**R_t = In (P_t) – In (P_{t-1})**		
	t-value	**τ**	**Durbin Watson**	**t-value**	**τ**	**Durbin Watson**
Nifty						
H0: Unit Root without drift	-5.163	-0.934	2.013	-11.202	-2.807	2.039
H0: Unit root with drift	0.091	0.013		5.881	1.050	
H0: Unit root with drift and trend	-1.260	-0.130		3.821	0.375	
Sensex						
H0: Unit Root without drift	-0.811	-4.834	2.022	-10.617	-2.610	2.042
H0: Unit root with drift	-0.010	-0.079		5.410	0.941	
H0: Unit root with drift and trend	-0.157	-1.557		3.311	0.322	
Exchange Rate						
H0: Unit Root without drift	-4.968	-0.818	1.975	-8.503	-2.196	1.999
H0: Unit root with drift	-0.042	-0.006		3.203	0.606	
H0: Unit root with drift and trend	-0.501	-0.053		1.599	0.170	
Foreign Reserves						
H0: Unit Root without drift	-5.734	-1.080	1.998	-8.274	-2.216	2.034
H0: Unit root with drift	0.647	0.096		2.899	0.564	

H0: Unit root with drift and trend	-0.128	-0.013		1.028	0.108	
Trade Balances						
H0: Unit Root without drift	-7.248	-1.728	1.996	-11.344	-3.175	2.092
H0: Unit root with drift	1.941	0.349		5.682	1.163	
H0: Unit root with drift and trend	0.736	0.079		3.689	0.372	
Inflation Rate						
H0: Unit Root without drift	-5.686	-0.959	1.956	-9.323	-2.331	2.056
H0: Unit root with drift	0.226	0.031		3.598	0.665	
H0: Unit root with drift and trend	0.029	0.003		2.301	0.230	
Interest Rate						
H0: Unit Root without drift	-4.629	-0.712	2.006	-8.931	-2.281	2.060
H0: Unit root with drift	-0.450	-0.057		3.870	0.707	
H0: Unit root with drift and trend	-1.906	-0.193		1.650	0.173	

Table- 3 presents the result of descriptive statistics of select variables. The standard deviation which shows the variability of the data from the average is less than one means that data of the select variables is very near to average

The skewness is reported negatively among all variables except exchange rate, trade balances, and inflation rate demonstrates that distribution curves of these variables are positively skewed in the left-tale. The kurtosis shows the positive values which range from 0.419 to 6.008 that data is having leptokurtic distribution (where point along the X- axis are clustered resulting in a higher peak) because the range of difference in the value of kurtosis of all variables is very high.

Table 3: Descriptive Statistics of Select Variables

Variables	Minimum	Maximum	Mean	Variance	Std. Deviation	Skewness	Kurtosis
Nifty	-0.13	0.11	0.002	0.001	0.031	-0.608	3.997
Sensex	-0.12	0.11	0.002	0.001	0.0291	-0.393	3.823
Exchange Rate	-0.02	0.03	0.002	0.000	0.010	0.483	0.419
Foreign Reserves	-0.04	0.03	0.003	0.000	0.011	-0.597	2.346
Trade Balances	-0.40	0.53	-0.001	0.019	0.139	0.180	2.063
Inflation Rate	-0.66	0.31	0.016	0.073	0.271	0.375	6.008
Interest Rate	-0.22	0.15	0.001	0.002	0.047	-0.758	5.910

The bivariate correlation of selected study variables is given in table-4. In each cell of the correlation matrix, we get two elements which are Pearson correlation coefficient and p-value with a two-tailed test of significance.

Table 4: Correlations Between Predictors

		Exchange Rate	Foreign Reserves	Trade Balances	Inflation Rate	Interest Rate
Exchange Rate	R (P-Value)	1				
Foreign Reserves	R (P-Value)	.392** (.000)	1			
Trade Balances	R (P-Value)	-.312** (.002)	-.074 (.476)	1		
Inflation Rate	R (P-Value)	-.125 (.226)	-.022 (.833)	.048 (.642)	1	
Interest Rate	R (P-Value)	.222* (.030)	.223* (.030)	-.238* (.020)	-.097 (.349)	1

From the table-4 it can be seen that correlation coefficient between Exchange rate (Ex Rate) and foreign reserves is 0.392 which is significantly less than 0.001, similarly, there is a low negative correlation between exchange rate and inflation -0.125 and exchange rate and trade balance -0.312. Further, the table shows that there is low association between the exchange rate and foreign reserves, exchange rate and trade balances, exchange rate and interest rate, foreign reserves and interest rate, trade balances and interest rate with a correlation coefficient of (0.392, -0.312, 0.222, 0.223 and -0.238) respectively. So, it can be concluded that all independent (predictor) variables have a low association and are fit for regression analysis.

Table 5: Zero -Order Correlation of Nifty and Predictors

		Exchange Rate	Foreign Reserves	Trade Bal	Inflation Rate	Interest Rate
Nifty	P R (P-Value)	-.376**	-.151	.086	.119	-.080
	Sig. (2-Tailed)	.000	.144	.408	.250	.443

Table-5 demonstrates that correlation coefficient of the exchange rate (-0.376) and nifty is significant at one percent. The results from correlation analysis present that exchange rate is the only factor somehow determining the return of nifty. The negative relationship between exchange rate and stock market indices that a decrease in exchange rate stimulates the stock market to move upward marginally and *vice versa*. Further, the table depicts a very low insignificant negative correlation between nifty and foreign reserves, interest rate and a low insignificant positive relationship between exchange rate and trade balances and an inflation rate depicts that all the variables are less responsible for the movement in the stock market.

Table 6: Zero-Order Correlation of Sensex and Predictors

		Exchange Rate	Foreign Reserves	Trade Bal	Inflation Rate	Interest Rate
Sensex	r (p-value)	-.461**	-.225*	.117	.055	-.135
	Sig. (2-tailed)	.000	.029	.257	.597	.193

Table-6 presents the zero-order correlation coefficient of Sensex and the predictors. The exchange rate is having moderate -0.461 significant associations to the dependent variable, foreign reserves also having low negative -0.225 significant negative relations. It means that exchange rate and foreign reserves are significant factors which are determining the return of Sensex. The negative relationship between exchange rate and foreign reserves to stock market indices (Sensex) that a decrease in the exchange rate and foreign reserves stimulate the stock market to move upward marginally and *vice versa*. Further, trade balances, inflation and interest rate having an insignificant relationship to the stock market.

Table 7: Regression Results of Nifty and Predictors

	Coefficient of the independent variables								
Constant	**Exchange Rate**	**Foreign Reserves**	**Trade Bal.**	**Inflation Rate**	**Interest Rate**	**R^2**	**ANOVA F**	**P-value**	**Durbin-Watson**
0.004	-1.194**	-0.014	-0.008	0.008	0.003	0.148	3.096	0.13	2.035
(1.402)	(-3.338)	(-.046)	(-.331)	(.746)	(.040)				

Note:* = 5% level of significance **= 1% level of significance

Table 8: Regression Results of Sensex and Predictors

	Coefficient of the independent variables								
Constant	**Exchange Rate**	**Foreign Reserves**	**Trade Balances**	**Inflation Rate**	**Interest Rate**	**R^2**	**ANOVA F**	**P-value**	**Durbin-Watson**
0.005	**-1.367****	-.122	-.007	.000	.021	**0.216****	**4.917****	.073	2.035
(1.813)	(-4.126)	(-.427)	(-.331)	(-.040	(-.341)				

Note: * = 5% level of significance **= 1% level of significance

To gain further insight emphasis can be put on Table-7 and 8 which presents the summary result of the regression model and F-statistics. The value of the coefficient of determination (R^2) is 0.148 for Nifty and 0.216 for Sensex which is an indication of the explanatory power of regression equation. In other words, the independent variables under regression model explain more than 15 percent of the variation in stock return of nifty and 22 percent for Sensex. The f-value 3.096 for Nifty and 4.917 for Sensex also indicated that the predictors or independent variables are determinants of stock return for both stock markets.

The values of Durbin-Watson (D-W test) from table 7 and 8 applied to examine the existence of autocorrelation in the pooled data series, reveals the absence of auto colinearity in each variable under study as it is less than three (2.035) for both stock exchanges. Hence, the model provides the reliable results.

Further, correlation and regression results as provided by table 5, 6, 7, and 8 established that the Exchange Rate emerged as the most significant variable with t-value -1.194 and -1.367 which is significant at one percent and presenting the negative relationship between stock return and Exchange Rate. The significant Exchange Rate coefficient registers the importance to explain the stock return and also provides the signal for volatility.

The regression results established that among the independent variables, the Exchange Rate has the highest impact on Indian share markets (Nifty and Sensex). The table 7 and further shows that Exchange Rate is the independent variable which contributes the highest variation to the stock market with a beta value of -3.338 for nifty and -4.126 for Sensex which is also significant at one percent. So, it can be concluded that among all the variables, Exchange Rate emerges as the strongest determinants of Indian stock market (Nifty and Sensex).

Conclusion

In this paper, we examine the impact of macroeconomic variables on stock indices. The study conducted on monthly data from 2008 to 2016 of stock markets and macroeconomic variables includes the exchange rate, foreign reserves, trade balances, inflation rate, and interest rate. It has brought out that exchange rate has the phenomenal impact on Indian stock markets. Also, the explanatory power of exchange rate is negative in direction. The findings also support the results of

Olowe (2007) [26], Sharma and Mahendru (2010) [31], Olowe (2011) [3], Osisanwa and Atanda (2012) [27], and Subburayan and Srinivasan (2014) [32].

In nutshell, we can conclude that there is the existence of a relationship between stock indices and macroeconomic variables. The exchange rate is the main predictor for causing the variations among all predictors. Other variables like foreign reserves, trade balances, inflation rate and interest rate are having a very low insignificant impact on the return of stock indices.

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