International Journal of Recent Development in Engineering and Technology
Website: www.ijrdet.com (ISSN 2347-6435 (Online) Volume 15, Issue 07, July 2026)

Impact of Exchange Rate Fluctuation on Indian Stock Market Volatility: A Study with Reference to BSE Sensex

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***Abstract*-- The Indian stock market plays an important role in contributing to the progress of the Indian economy. The stock market is basically an arena for all investors—be it Indian or foreign—to place their investments and trade the money for capital gains and returns on investment. The stock market acts as the primary institution of the financial sector as it provides a platform for both the users as well as providers of the financial resources for investment in the shares of the companies. The present study seeks to examine the effect of fluctuations in the exchange rate on the volatility of Indian stock market, particularly with reference to BSE Sensex. With BSE Sensex being the dependent variable and Indian Rupee against US Dollar being the independent variable. The study has taken monthly data for a period of 10 years from 2014-2015 to 2023-2024 on financial year basis. The study analyzed using Descriptive Statistics, Correlation, Linear Regression Analyses, Normality Test, Friedman Test and Wilcoxon Singed Ranks Test. The results of the study revealed that the macroeconomic variable significantly impact on the changes in BSE Sensex.**

***Keywords*-- BSE Sensex, Exchange Rate, Volatility, SEBI.**

I. Introduction

In India the emergence of stock market happened in the 19th century. The first stock market was established in Bombay in 1975 by the Native Share and Stock Broker's Association which was based at Dalal Street. The efforts were made by Premchand Roychand who was a cloth trader to establish this stock exchange in 1875. The Securities and Contract (Regulation) Act, 1956 empowered the Central Government to regulate the working stock exchange. Stock market plays a pivotal role in growing industries and commerce of a country that eventually affect the economy (Naik & Padhi, 2012). The stock market makes long term capital available to firms for investment purposes. The market performs the intermediation process by pooling funds from different investors who wish to put their surplus funds in alternative investment avenues.

Before investing funds, investors carefully follow the stock market performance by checking the composite market index as an indicator. It has been revealed that macro economic elements give a lot of input concerning developments in the stock market. The study of finance economics shows that several macroeconomic variables can predict returns for the stock market (Mukhopadhyay & Sarkar, 2003). Such elements are congruous with the development of the economy as a whole. Indian stock market has been consistently growing in investment figures by foreign players (Kejriwal Harshit Dilip & Parvathy VK, 2018). The rise in investments from foreign plyers also suggests that factors impacting the investment decision of such foreign players can have a great impact on the Indian stock market. The exchange rate happens to be one of such major factors that cannot be overlooked upon. Moreover, the exchange rates do have a significant impact on various decision regarding exports, imports, investments, banking policies, economic institutions, etc. Thus, it can be said that exchange rates have significant implications on economy's business cycle and various financial markets. The study focuses on the impact of exchange rate fluctuation on Indian Stock Market volatility: A study with reference to BSE Sensex.

II. Bombay Stock Exchange In India

The Bombay Stock is the oldest stock exchange in Asia. It was established in 1875. Originally, it was started as "The Native Share and Stock Brokers Association". It is the first stock exchange to have obtained permission from the Government of India under securities contracts (Regulation) Act, 1956. BSE has shifted from an open outlay system of trading to a fully computerized mode of trading, namely BOLT (BSE Online Trading) with effect from14 March 1995 member brokers enter orders from tradework stations. Buyer and Seller do not meet each other.

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Scrip's traded are classified into A_1, B1, B2and Z groups. Moreover, F Groups indicates fixed income bearing securities and G Group is meant for trading in Government securities by retail investors. The Surveillance Department keeps track of Stokholders by checking their portfolio's prices and the amount of securities. The major markets are BSE Sensex, BSE Midcap, BSE Small cap, BSE 100, BSE Bharat 22 Index, BSE 200, BSE Large cap, Select Index, BSE 500, BSE Sensex 50, BSE Sensex Next 50 etc. The BSE is the largest Stock market Sector Exchange in India, where over 5,246 companies are listed on its platform as of 8 February 2022. On 4 October 2024, BSE was the 6th most valuable stoke exchange in the world, with a valuation of more than $5.3 trillion.

Securities and Exchange Board of India

Securities and Exchange Board of India is the organization which is responsible for monitoring the stock and commodity trading in India. It was established to operate under the supervision of the ministry of Finance of the Government of India. The organization was formed in April 12, 1988 and was given legal powers through SEBI Act in 1992.

Definition of stock exchange section 2 (1)

"Anybody of individuals,whether incorporated or not, constituted for the purpose of assisting regulating or controlling the business of buying selling, or dealing in securities".

III. Statement Of The Problem

Since 1875, Indian Stock market has been achieved rapid growth and numerous companies have been established in India. They raise their capital through this regulated stock market. Awareness level of Stock market among investors has increased slowly and steadily. Every investor in Stock market has interested to know the change is Stock Price indices by the impact of Macroeconomic variable. Even though there are large Number of Macroeconomic variables, Exchange rate plays a vital role in stock market price fluctuations. So thus, study focus on impact of changes is exchange rate on fluctuations is Sensex. Last 10 Financial year data have been taken for the study with an assumption of exchange rate as independent variable and Sensex as dependent variable. This study analysis the correlate and identity the value of Sensex related to exchange rate using Linear Regression Analysis, Normality Test, Friedman Test and Wilcoxon Singed Ranks Test. The results of the analysis help to provide clear picture of market changes due to exchange rate fluctuation.

Objectives Of The Study

- To know the relationship between exchange rate and stock market volatility.
- To Find out Significant relationship between exchange rate and BSE Sensex.
- To analyze the impact of exchange rate fluctuation on BSE Sensex.

IV. Research Of Methodology

Collection of Data

The study is based on secondary data. In the Study, Macroeconomic factor namely exchange rate is taken as independent variable and BSE Sensex is taken as dependent variable. This study has been taking closing monthly data for a period of April 1, 2014 to March31, 2024. The Secondary data have been collected from respected websites of BSE and Reserve Bank of India official website of Database on Indian Economy (DBIE). Moreover, the published literature informs of books, Journals and various websites have been used for the study websites have been used for the study.

Duration of the Study

The timeframe of the study is defined as ten years running from 2014-2015 to the period ending with 2023-2024.

Statistical Tools and Techniques

The information gathered has been examined using the appropriate statistical tools and techniques, including descriptive statistics, correlation, linear regression analyses, normality test, Friedman test, and Wilcoxon signed ranks test with the help of the statistical software Statistica Package for Social Sciences (SPSS Version 26).

HYPOTHESIS

Null Hypothesis.

H0: There is no significant relationship between exchange rate and BSE Sensex**.**

Alternative Hypothesis.

H1: There is significant relationship between exchange rate and BSE Sensex.

V. Review Of Literature

Dr. Gaurav Agarwal et al. (2010) perform an analysis of exchange rate movement and volatility in the stock market. Their research investigates the connection between Nifty returns and the exchange rate of rupee and dollar.

The observed time frame is determined from October 11, 2007, until March 9, 2009, utilizing daily closing figures. The aforementioned research applied the following statistical tools: Normality, Unit Root, Augmented Dickey Fuller, and Granger's Causality. The conclusions drawn from the Normality Test indicate that Nifty returns and exchange rate figures exhibit non-normal distribution. To find the negative correlation between the two variables, the researchers employed correlation analysis.

Prabakaran, V. (2014) investigated the dynamic interactions of macroeconomic and stock market movements in India. The study was taken as independent variable namely gold rate, value of debt traded, rate of exchange and oil prices and dependent variable was taken s NSE Nifty. Regression model was applied to analyze the impact level of macroeconomic variable on NSE Nifty during the year 2009-2011. The study showed the Indian stock market is significantly affected by the exchange rates and oil prices.

Agrawal and Srivastava (2011) investigated the stock market returns and exchange rate volatility: A GARCH application. The study revealed that there is existence of a positive significant relationship between volatility in stock returns and exchange rate and an also a bidirectional causality between exchange rate and stock market; and through the GARCH model.

Gurmeet Singh (2015) This paper studies the association of the exchange rate and stock market in India: A quantitative approach. The indicators taken for this study are NSE Nifty and exchange rate. The duration of the study is from January 2007 to March 2014. The parameters for the study use Johansen co-integration and Granger causality for the investigation of a long-run equilibrium relationship among exchange rate and stock price. The results of the study show that the exchange rate and Nifty (the stock price indicator) have a long-run relationship. It is noted that the exchange rate and the stock indicators Nifty follow a positive relationship, and the exchange rate plays a very significant role in determining the stock price and the stock price follows and influences the exchange rate in most cases.

Mostafa Ali and Gang Sun (2017) Investigate the fluctuating connection between stock price and Exchange rate: Evidence from South Asia. Data were gathered from January 1, 2009, to June 30, 2015. Various statistical methods including unit-root tests, cointegration tests, Granger causality tests, VECM model, VAR model were employed in this study.

Results show that there's a negative long-term relationship which goes from exchange rate to stock price while there's an unidirectional causal relationship from stock price to exchange rate in India.

Piyali Roy Chowdhury and Anuradha. A (2018) entitled "Impact of Exchange rate fluctuation on stock market volatility – A study to predict the economic scenario in India". The study selected one macroeconomic variable; exchange rate is studied with Indian stock market (BSE Index). The main focus of the researcher is to find out the impact of exchange rate fluctuation on stock market volatility to predict the economic scenario in India. The study found significant relationship with BSE index and exchange rate.

Dr.S. Sathyanarayanan and Prof Sudhindra Gargesha (2018) investigate the impact of macroeconomic variables on Indian stock market: Evidence from BSE Sensex and Nifty 50. Macroeconomic variables have been taken as inflation, crude prices, foreign exchange and interest rate. The study data have collected from 2000 to 2017. The study revealed that the independent variables foreign exchange and crude prices are responsible for transmission of volatility in Sensex and Nifty 50 (bench mark indices). However, interest rate and inflation were not responsible for the same.

Lakshmanasamy.T (2021) examines the relationship between exchange rate and stock market volatilities in India: ARCH-GARCH estimation of the causal effects. The present research utilized the closing prices on BSE Sensex stock index and essential exchange rates such as US dollar/rupee, European euro/Indian rupee and British pound/rupee on daily basis for the period extending from January 5, 2010 to December 31, 2015. The data collected in the research reveals empirical evidence of highly significant positive effect of measured volatility of euro/rupee exchange rate on the volatility of returns on BSE Sensex index. In contrast, the measured volatility of EUR/INR and GBP/INR exchange rates appears to have insignificant negative impact on the volatility.

M. Jegadeeshwaran and P. Navitha (2022) analyze the effects of macroeconomic variables on the Nifty Private Bank Index and Nifty PSU Index using data for a period of 10 years from 2012 to 2021. The findings of the research reveal that the inflation rate has a negative correlation to both the Nifty Private Bank Index and the Nifty PSU Index; Exchange rate is positively correlated with the Nifty Private Bank Index, but negatively correlated with the Nifty PSU Index; Interest rate has a negative correlation with the Nifty Private Bank Index, but a positive relationship with the Nifty PSU Index.

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Van-Hop Nguyen (2019) The research examines the long run and short run linkage of the exchange rates with that of the stock prices in both developed and developing countries. The study employs co-integration analysis and tests for Multivariant Granger Causality estimation.

The analysis spans across a period of six different countries such as Japan, UK, Hong Kong, China, India and Brazil from December 2007 to May 2013. It was found that the linkage of the exchange rate with the stock index is of long run nature.

VI. Data Analysis And Interpretation

Table-1 DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std. Deviation
BSE -Sensex	120	22417.80	73651.35	41065.7881	14202.42705
Exchange Rate	120	59.03	83.37	71.1401	6.75588
Valid N (listwise)	120				

Table -1 show about the descriptive statistics variation of share price on BSE Sensex and exchange rate for the corresponding financial year 2014-2015 to 2023-2024. The analysis found that the mean value Sensex for 10 years is 41065.7881 with standard deviation is 14202.42705.

The minimum value of Sensex is 22417.80 and maximum value is 73651.35. Average exchange rate for 10 years is 71.14 percentages along with a standard deviation of 6.75 and minimum value is 59.03 percentages and maximum value is 83.37 percentages.

Table-2 ONE-SAMPLE T- TEST

	N	Mean	Std. Deviation	Std. Error Mean
BSE -Sensex	120	41065.7881	14202.42705	1296.49828
Exchange Rate	120	71.1401	6.75588	.61672

	Test Value = 70					
					95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
BSE -Sensex	31.620	119	.000	40995.78808	38428.5920	43562.9842
Exchange Rate	1.849	119	.067	1.14008	-.0811	2.3613

From the above table -2 of one sample T-Test. Since P-Value of T-Test is 0.000 is less than 0.05, the null hypothesis will be rejected indicating that there is a significant relationship between exchange rate and BSE Sensex.

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Table-3 CORRELATIONS

		BSE -Sensex	Exchange Rate
BSE -Sensex	Pearson Correlation	1	.897**
	Sig. (2-tailed)		.000
	N	120	120
Exchange Rate	Pearson Correlation	.897**	1
	Sig. (2-tailed)	.000	
	N	120	120

**. Correlation is significant at the 0.01 level (2-tailed).

From the above table -3 elaborate the results of correlation between independent variable and dependent variable. The results found that there is highly strong positive relationship between exchange rate and BSE Sensex.

Table-4 MODEL SUMMARY

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.897[a]	.805	.803	6298.25574

a. Predictors: (Constant), Exchange Rate

Model summary table-4 shows that the value of co-efficient of determinationi.e. R Square is 0.805 which means that 80.5% variation in the dependent variable of BSE Sensex is explained by the independent variable of exchange rate.

This is also meaningremnant 19.5% depends on the others factors also. R shows that 0.897, it shows strong Linear relationship exist between macroeconomic variable with BSE Sensex.

Table-5 ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	19322536174.961	1	19322536174.961	487.106	.000[b]
	Residual	4680826988.017	118	39668025.322		
	Total	24003363162.977	119			

a. Dependent Variable: BSE -Sensex

b. Predictors: (Constant), Exchange Rate

ANOVA table-5 shows that the independent variable of exchange rate statistically significantly predicts the dependent variable of BSE Sensex. F statistics shows higher value which means the model is goodness of fit for further interpretation.

The P value is 0.000 is less than 0.05, the null hypothesis Ho is rejected at 5% level of significance and it is concluded that there is significantly affect the stock price volatility on BSE Sensex.

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Table-6 LINEAR REGRESSION COEFFICIENTS

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-93115.190	6106.784		-15.248	.000
	Exchange Rate	1886.152	85.460	.897	22.070	.000

a. Dependent Variable: BSE -Sensex

Linear Regression co-efficient table-6 shows that the stock price volatility on BSE Sensex is –93115.190(constant) when another independent variable to be taken as Zero. Therefore, the formula for regression equation,

$y = a + bx$

Where, Y= Share price volatility of BSE Sensex (SP_{BSE}),

a = Intercept of Y which is Constant
b = Slope, x = Exchange Rate (ExR)
SP_{BSE}= -93115.190 + 1886.152 ExR

Independent variable on Share price volatility of BSE Sensex arises due to exchange rate can lead to increase in BSE Sensex by 1886.152. Exchange rate is positive relationship with BSE Sensex.

Table-7 FRIEDMAN TEST

		Test Statistics[a]	
BSE -Sensex	Mean Rank	N	120
	2.00	Chi-Square	120.000
		df	1
Exchange Rate	1.00	Asymp. Sig.	.000

Table -7 show F-Test. Since P-Value of F-Test is 0.000 is lower than 0.05, the alternative hypothesisaccepted indicating that the overall model is significant.

Table-8 NORMALITY TEST

		BSE -Sensex	Exchange Rate
N		120	120
Normal Parameters[a,b]	Mean	41065.7881	Normal Parameters[a,b]
	Std. Deviation	14202.42705	
Most Extreme Differences	Absolute	.163	Most Extreme Differences
	Positive	.163	
	Negative	-.112	
Test Statistic		.163	.097
Asymp. Sig. (2-tailed)		.000[c]	.008[c]

a. Test distribution is Normal.

b. Calculated from data.

c. Lilliefors Significance Correction.

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From the above table -8 Test of Normality. Since P-Valueof Kolmogorov-Smirnov Test is 0.000 is less than 0.05, thenullhypothesis not accepted and there is a significant relationship between exchange rate and BSE Sensex.

Table-9 WILCOXON SIGNED RANKS TEST

	Exchange Rate - BSE -Sensex
Z	-9.506[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on positive ranks.

According to the table number 9 Wilcoxon Signed Rank Test. The outcome of the research indicates that the significance of the problem is 0.000 which is less than 0.05 at 5% significance level. Therefore, the null hypothesis is rejected and it is inferred that there is a significant association between the exchange rate and BSE Sensex.

VII. Findings Of The Study

- The analysis found that the mean value Sensex for 10 years is 41065.7881 with standard deviation is 14202.42705. The minimum value of Sensex is 22417.80 and maximum value is 73651.35.
- Average exchange rate for 10 years is 71.14 percentages along with a standard deviation of 6.75 and minimum value is 59.03 percentages and maximum value is 83.37 percentages.
- The correlation results found that there is highly strong positive relationship between exchange rate and BSE Sensex.
- ANOVA results shows that the independent variable of exchange rate statistically significantly predicts the dependent variable of BSE Sensex.
- Independent variable on Share price volatility of BSE Sensex arises due to exchange rate can lead to increase in BSE Sensex by 1886.152. Exchange rate is positive relationship with BSE Sensex.
- F-Test. Since P-Value of F-Test is 0.000 is lower than 0.05, the alternative hypothesis accepted indicating that the overall model is significant.
- Wilcoxon Signed Rank Test is observed that there is significantly relationship between exchange rate and BSE Sensex.

VIII. Conclusion Of The Study

Many research studies have analyzed that the impact of exchange rate on share price. Most of them have used US dollar as exchange rate for the measurement since it is the most recognized currency all over the world. Gurloveleen & Bhatia (2015) Gurmeet Sing (2015), Piyali Roy Chowdhury & Aruradha. A (2018) and Lakshmanasamy. T (2021) found significant relationship with BSE index and exchange rate in their studies. This study focuses on the impact of exchange rate fluctuation on Indian stock market. The study has taken BSE Sensex as dependent variable and exchange rate (US dollar) as independent variable. The study has taken closing monthly data for a period of 10 years from 2014-2015 to 2023-2024 on financial year basis. The study reveals that the exchange rate (US dollar) impact on stock price (BSE Sensex). There is 89.7% correlation of exchange rate with stock price. The results found that there is strong positive relationship between exchange rate and BSE Sensex. The results of linear regression analysis R^2 is 0.805 which means that 80.5% variation in the exchange rate with stock price. The impact of exchange rate on stock price is significant T-Test, F-Test, Normality Test and Wilcoxon signed Test have found that the significance value of the problem is 0.000 which is less than 0.05 at 5% level of significance Null hypothesis is rejected. The study concluded that there is significantly relationship between exchange rate and BSE Sensex. Currently in India, central bank has also changed their policy interest rates. So that all share price index also exposed to those controls indirectly. In order to keep higher share prices. Which would attract investment, policy makers should keep the interest rate at a low level. The study has useful to policy makers, regulators, Researchers and investment community to aware more economic variables and their impact on stock indices.

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