



# Interest Rate and Stock Market: In Context of India

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## Abstract:

*This paper analyzes the impact of Interest Rate on India Stock Market. For this study, the values of Call Rate as Interest Rate and BSE-SENSEX as Indian Stock Market have been taken. It analyses the impact of Interest Rate on Indian Stock Market. Correlation, Regression and Causality Test have been employed to check the impact of independent variable on dependent variable. Monthly data has been used in the study for the period from 2005 to 2018. From the analysis we explained that there is positive and good relationship between Exchange Rate and Indian Stock Market and Exchange rate effects Indian Stock Market in a positive manner.*

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**Keywords:** Interest rate (call rate), BSE-sensex, Correlation, Regression, Causality

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## 1. Introduction

One of the most important places for business professionals to manage their finances is the stock market. This enables companies to raise funds through the sale of company shares for trade or business growth by granting them ownership in the company on the open market. Additionally, it enables investors to quickly sell their shares. Compared to other investment components, it offers investors greater liquidity.

The Indian government started implementing globalisation and liberalisation policies in 1991. Following the implementation of these policies, the Indian capital market saw significant transformation, and the stock market's significance increased daily. The stock market has evolved into a crucial component of the modern economy, providing financial corporations with the capital they need to support both economic expansion and financial development. For the corporate sector as well as for investors looking to maximise their savings through investment, the stock market is crucial. As everyone is aware, since its launch in January 2008, the Bombay Stock Exchange (BSE) Sensitivity Index (SENSEX) has tracked the performance of the Indian stock market, reaching a level of 21000 points. However, the upward trend is short-lived, as the BSE-SENSEX drops as low as 7000 level points in 2008–2009. And then rise at its all-time high.

Numerous macro-economic factors impact the stock market, and the Indian stock market is not immune to them. Many experts claim that fundamental and technical analysis can be used to fairly assess stock market movement. In addition to this, a few macro-economic factors have a significant influence on how the stock market moves. These factors include factors like GDP, interest rates, monetary policy, inflation, IIP, FII, and so on. India began implementing a globalization policy in 1991, and since then, it has gradually made significant contributions to world affairs. More significantly, industrialized nations seeking a greater degree of economic integration have found that investing in Indian stock markets is a wise move. One of the key macro-economic factors influencing international and national investors' decisions is the interest rate. Investors can better appreciate how changes in interest rates may affect their investments by knowing the relationship between the stock market and interest rates.

Additionally, they can be more equipped to make wiser financial choices. Interest rate fluctuations are therefore crucial components of the economy. Thus, it is essential to examine how the interest rate affects the Indian stock market.

## **2. Interest rate**

Interest rate is the total amount of interest owed, expressed as a percentage of the amount lent, borrowed, or deposited, each quarter or year. The total interest on an amount lent or borrowed relies on the principal amount, the interest rate, the frequency of compounding, and the duration of the loan or borrowing. Expected earnings is one of the elements that influences stock prices. Since corporations run with some debt on their balance sheet, interest rates can have an impact on expected earnings. Banks will eventually hike loan rates if the repo rate keeps rising. Corporates will incur increased loan payback charges because of this. Increasing expenses lower net profit, and stock prices reflect this. When applied to equities stocks, this has a detrimental effect. Therefore, high returns from stocks are unlikely to occur during an interest rate cycle that is trending upward. When interest rates are lowered, the opposite occurs. Upon examining the correlation between macro-economic factors, we discover that the independent variable interest rate has a less effect on the indices than inflation does, and that the effect on the Sensex is even smaller. There are various types of rates used in various economic studies and research such as real interest rate, nominal interest rate, bank rate, repo rate, annual percentage rate, prime rate, discount rate, call money rate etc. This study takes into consideration the Call Money Rate as an indicator of Interest Rate.

## **3. Call Rate**

The interest rate that banks charge brokers who borrow money to support transactions in their clients' margin accounts is known as the call money rate. It is also referred to as the broker loan rate, and it is not accessible to private citizens. Usually, it is only used for one day. The borrowing rate that an investor will pay when trading on margin in their brokerage account is determined by the call money rate. Margin trading is a high-risk trading practise where investors use borrowed funds to execute deals. Investing with borrowed funds raises the investors' leverage, which raises the investment's risk.

## **4. Indian stock market**

The Bombay Stock Exchange, India's first stock exchange, was founded in Bombay in 1875. Then, in 1908, the Calcutta Stock Exchange and the Chennai Stock Exchange were founded. Significant speculative activity during World War II led to the country's stock exchanges growing from seven in 1939 to roughly 21 in 1947. One of these was the founding of the Delhi Stock Exchange in 1947. While all these transactions were organized, there are also unorganized market activities in the economy.

## **5. Bombay Stock Exchange (BSE-SENSEX)**

Asia's oldest stock exchange is the Bombay Stock Exchange. Established in 1875, BSE Ltd. Before, it was called the Bombay Stock Exchange. "The Native Share and Stock Brokers' Association" was its original name. It's among the quickest stock exchanges in Asia. It moves at 200 microseconds per second. It is one of the top exchange organizations in India. On August 31, 1957, the Securities Contracts Regulation Act granted recognition to the Indian government for the first time to BSE, a stock exchange. The exchange relocated to the Phiroze Jeejeebhoy Towers on Dalal Street in the Fort neighborhood in 1980. The BSE SENSEX index was created in 1986 to give the exchange a way to gauge its overall performance. It was utilized to launch its derivatives market in 2000. They began dealing with futures contracts for the SENSEX. In 2001 and 2002, trading in equities derivatives and SENSEX options began.

## **6. Review of literature**

Omran (2003) in his paper entitled "Time Series Analysis of the Impact of Real Interest Rates on Stock Market Activity and Liquidity in Egypt: Co-integration and Error Correction Model Approach"

examined the impact of real interest rates on performance of the Egyptian stock market in terms of market activity and liquidity. He used secondary data and applied co-integration test through Error Correlation Mechanisms (ECM). The study revealed that there was a significant long run and short run relationships found between the key variables. The study also found that the real interest rates had an impact upon stock market performance.

Ologunde, Elumilade and Asaolu (2006) in the paper titled “Stock Market Capitalization and Interest Rate in Nigeria: A Time Series Analysis” examined the relationship between stock market capitalization rate and interest rate. Regression analysis had been used for analyzing the time series data for Central Bank of Nigeria (CBN) and Nigerian Stock Exchange (NSE). The results found that the existing interest rates provide a positive impact on the stock market capitalization rate. Government development stock rate provides a negative impact on the stock market capitalization rate and existing interest rate provides a negative impact on government development stock rate.

Uddin and Alam (2010) in the paper titled “The impact of Interest Rate on Stock Market: Empirical Evidence from Dhaka Stock Exchange” examined the relationship between Interest Rate and Dhaka Stock Exchange (DSE). This study seeks evidence supporting the existence of market efficiency on the Dhaka Stock exchange (DSE) based on the daily general price index 1994 to 2005 and also shows empirical relationship between stock index and interest rate in Bangladesh based on monthly data from May 1992 to June 2004. The study used ordinary least square (OLS) regression test and found that Interest rate has significant negative relationship with stock prices and Growth of interest rate also has significant negative relationship with Growth of stock prices.

Singh and Arora (2010) in their paper entitled “Interest Rates and Stock Movements in Three Major Asian Countries-India, China and Japan” examined the effect of interest rates on stock market for Asian countries like India, China and Japan. The study revealed a significant correlation between Sensex and Interest rate and also for NIKKEI and interest rate, but not for China stock market. The study emphasized the need for government interference to increase investment in the Amman Stock Exchange by decreasing individual tax rates, thereby promoting asset creation, controlling interest rates so as to facilitate stock market growth and increasing the regulatory environment.

Husni Ali Khrawish et al. (2010) in their paper on “The relationships between stock market capitalization rate and interest rate: Evidence from Jordan” discussed the effect of interest rates on the stock market capitalization rate in Amman Stock Exchange (ASE) for the period from 1999 to 2008. The study used multiple linear regression model and simple regression model for analysis of the objectives. The time series analysis provides the conclusion that there was a significant and positive relationship between existing interest rate and stock market capitalization rate. The study also revealed that government development stock rate provides negative impact on the stock market capitalization rate and found a significant and negative relationship between existing interest rate and government development stock rate.

## 7. Objective

1. To analyze the correlation between Interest Rate (Call Rate) and Indian Stock Market (BSE-Sensex).
2. To analyze the causality between Interest Rate (Call Rate) and Indian stock market (BSE-Sensex).

## 8. Hypothesis

- H<sub>0</sub>: Interest rate does not Granger cause to Sensex.  
H<sub>1</sub>: Interest rate does Granger cause to Sensex.  
H<sub>0</sub>: Sensex does not Granger cause to Interest rate.  
H<sub>1</sub>: Sensex does Granger cause to Interest rate.

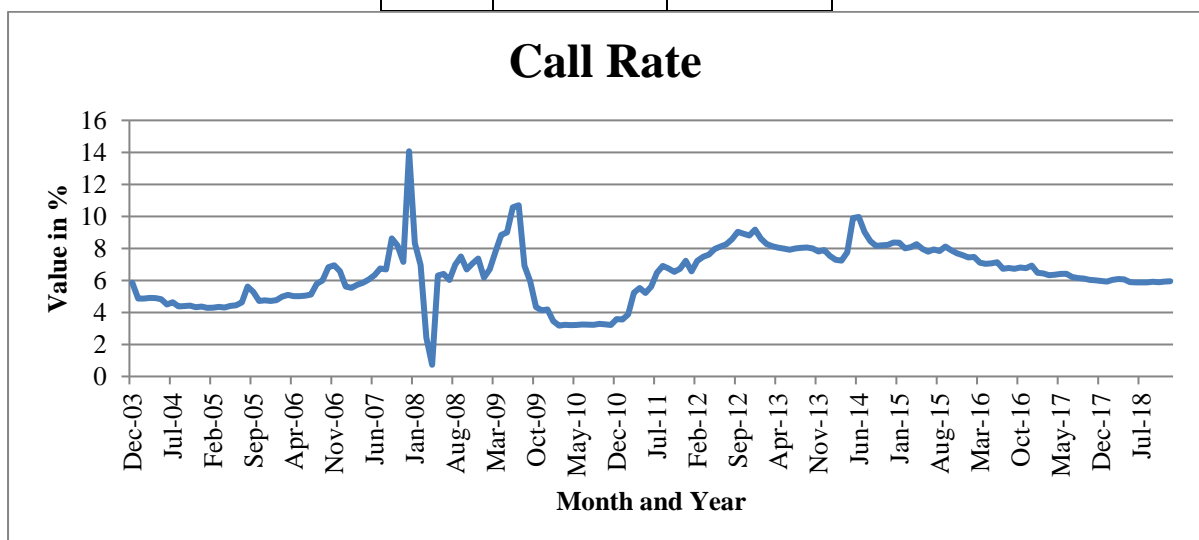
### 9. Research Methodology

We used secondary data for the variables like Indian stock market (BSE-SENSEX) and inflation (WPI) in order to examine this study. The Bombay Stock Exchange website, the Reserve Bank of India, and the RBI Bulletin are the sources of this data. We have used regression and correlation analysis to look at how the Indian stock market (BSE-SENSEX) is affected by changes in the WPI. For the years 2004 to 2018, the monthly secondary data was used.

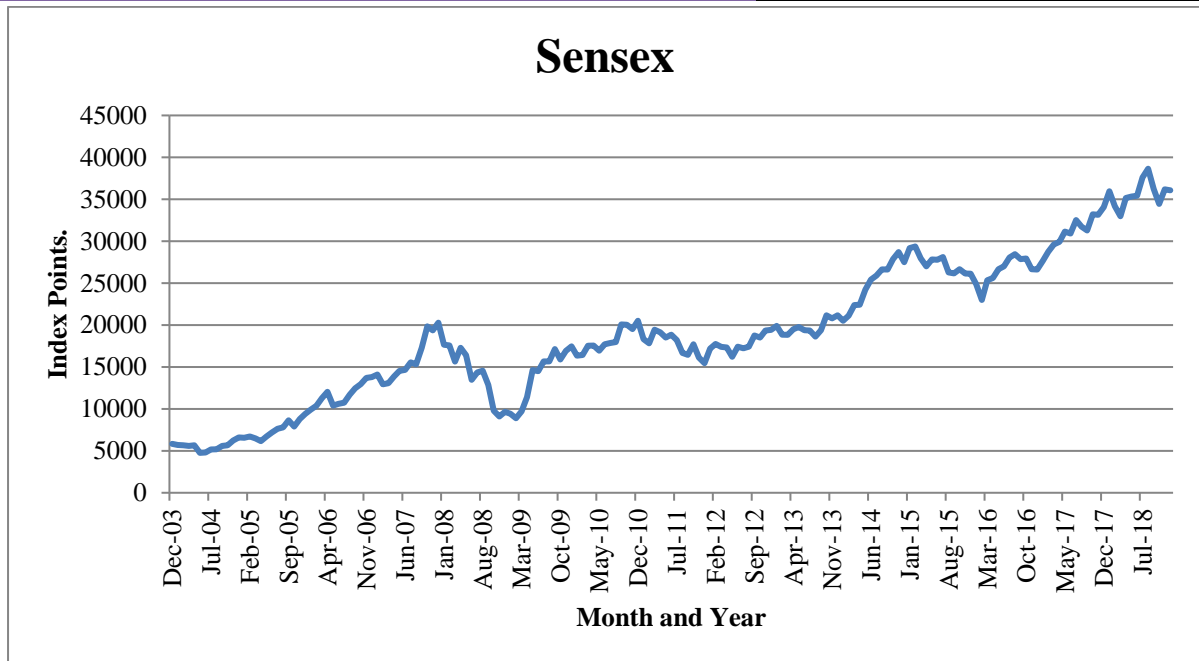
### 10. Tabular and graphical analysis

**Table 1: Average Yearly Values of Call Rate and Sensex**

Year	Call Rate	Sensex
2004	4.619167	5551.601
2005	4.653333	7498.368
2006	5.601667	11663.58
2007	7.218333	15901.44
2008	6.065833	14028.76
2009	7.11	13941.48
2010	3.281667	18207.56
2011	5.808333	17724.38
2012	8.146779	17834.85
2013	8.064474	19727.08
2014	8.342153	24941
2015	7.961128	27382.92
2016	6.999703	26505.69
2017	6.242259	31162.84
2018	5.943145	35683.95



Interest rate i.e. Call Rate rise in year 2004 to 2007, 2011 to 2014 whereas fall in year 2008, 2010 and 2015 to 2018.



It can be seen that there was a rise in SENSEX during 2004 to 2007, 2010, 2012 to 2015 and 2017 to 2018, whereas fall in the year 2008, 2009, 2011 and 2016.

### 11. Testing of structural break series

The relation between the dependent variable and independent variables may undergo a structural change. By structural change, we mean that the value of the parameters of the models do not remain the same throughout the entire time period. Sometimes the structural change may be due to external forces or due to policy changes or other causes. Structural break through Philip Perron Innovational Outlier and Additive Outlier on Intercept and both intercept and Slope.

**Table 2: Innovational Outlier Model for Determining the Break Date in Intercept (IO1) or Both Intercept and Slope (IO2)**

Variables	ADF test	Break Point	Result
Call Rate	-10.4577 ( $<0.01$ )	2008M01*	Stationary with Structural Break
SENSEX	-12.4425 ( $<0.01$ )	2006M12	Stationary

**Table 3: Additive Outlier Model for Determining the Break Date**

Variables	ADF test	Break Point	Result
Call Rate	-10.6681 ( $<0.01$ )	2014M06	Stationary
Sensex	-12.4033 ( $<0.01$ )	2005M07	Stationary

### Structural break analysis of interest rate (call rate)

Dependent Variable: CALL\_RATE

Method: Least Squares

Sample (adjusted): 2004M02 2018M12

Included observations: 179 after adjustments

Structural Break Analysis of Call Rate

**Table 4: Structural break analysis of interest rate (call rate)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CALL_RATER(-1)	0.232460	0.073395	3.167265	0.0018
C	-0.021392	0.071456	-0.299375	0.7650
TREND	0.001556	0.002592	0.600217	0.5491
INCPTBREAK	-0.133588	0.082203	-1.625095	0.1060
TRENDBREAK	-0.000664	0.002650	-0.250545	0.8025
BREAKDUM	-0.722284	0.248882	-2.902110	0.0042
R-squared	0.123557	Mean dependent var		-0.021803
Adjusted R-squared	0.098227	S.D. dependent var		0.253750
S.E. of regression	0.240965	Akaike info criterion		0.024617
Sum squared resid	10.04512	Schwarz criterion		0.131457
Log likelihood	3.796777	F-statistic		4.877764
Durbin-Watson stat	1.942491	Prob (F-statistic)		0.000336

It can be easily seen in table that the coefficient of BREAKDUM is statistically significant as associated p-value (0.0042) is less than 0.05. The overall model is a good fit as F-statistics (4.877764) is high and statistically significant since p-value associated with F-statistics is less than 0.05. The Durbin Watson statistics also support the result, as value near to 2 (1.94).

### Structural break analysis of sensex

Dependent Variable: SENSEXR

Method: Least Squares

Sample (adjusted): 2004M02 2018M12

Included observations: 179 after adjustments

**Table 5: Structural Break Analysis of SENSEX**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
SENSEX(-1)	0.055675	0.075895	0.733583	0.4642
C	-0.002100	0.022766	-0.092237	0.9266
TREND	0.001390	0.001141	1.218621	0.2246
INCPTBREAK	-0.046070	0.024662	-1.868084	0.0634
TRENDBREAK	-0.001318	0.001147	-1.148651	0.2523
BREAKDUM	0.004422	0.065936	0.067069	0.9466
R-squared	0.027404	Mean dependent var		0.008220
Adjusted R-squared	-0.000706	S.D. dependent var		0.064878
S.E. of regression	0.064901	Akaike info criterion		-2.598951

Sum squared resid	0.728709	Schwarz criterion	-2.492111
Log likelihood	238.6061	F-statistic	0.974882
Durbin-Watson stat	1.992919	Prob(F-statistic)	0.434655

It can be easily seen in table that the coefficient of BREAKDUM is statistically not significant as associated p-value (0.9466) is more than 0.05. The overall model is not fit as F-statistics (0.974882) is very less and statistically not significant since p-value associated with F-statistics is more than 0.05. But the Durbin Watson statistics is support the result, as value near to 2 (1.99).

We can see some trend breaker in the charts for BSE-Sensex. Major break is seen in the year 2008 when Sensex crashed from the top. The reason behind this trend break is global market crashes due to “U.S. Subprime Crisis”. Indian stock market also affected by the global crisis and it goes to level of 7000 points.

Indian government and Reserve Bank of India initiated some monetary and fiscal policies to control this downtrend. Stimulus packages were announced by the Government of India to recover market from the downtrend. First package announce by Government of India on 7<sup>th</sup> December, 2008, Second package on 2<sup>nd</sup> January, 2009, Third package on 24<sup>th</sup> February, 2009 and Fourth package on 26<sup>th</sup> February, 2009. So, Government of India announced four stimulus packages during the period of just 3 months and reason of it, we can see trend reversal in Sensex from March, 2009 and recovery has been started. Apart from these, some monetary measures also adopted by Reserve Bank of India and some measures also announced by Indian Banks’ Association.

### Pairwise Granger Causality Tests between Call Rate and SENSEX

Sample: 2004:01 2018:12

Lags: 4

Observation: 176

**Table 6: Pairwise Granger Causality Tests between Call Rate and SENSEX**

Null Hypothesis:	F-Statistic	Probability
LSENSEX does not Granger Cause LCALL	1.02930	0.39376
LCALL does not Granger Cause LSENSEX	2.88533	0.02414

The table reveals that the Granger Causality Test result which concerns with examining the impact of SENSEX on Call Rate. The reported F-value and P-Value suggest whether that causality between SENSEX and Call rate is exists or not. Here, null hypotheses are accepted at 5% significance level for SENSEX does not cause for Call Rate but null hypothesis is rejected at 5% significance level for Call Rate is cause for SENSEX. It can be said that there is unidirectional causality from Call Rate to SENSEX.

### Correlation

**Table 7: Correlation**

Variables	Call Rate	BSE-SENSEX
Call Rate	1.0000	0.3000
BSE-SENSEX	0.3000	1.0000
N	180	180

As per above table, correlation R= 0.3000 for the selected variables. That means there is positive relationship between Interest Rate (Call Rate) and Indian Stock Market (BSE-Sensex).

**Regression**

**Table 8: Sensex and interest rate (Call Rate)**

Dependent Variable: LSENSEX					
Method: Least Squares					
Sample: 2004M01 2018M12					
Included observations: 180					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
LCALL	0.51778	0.10910	4.74585	0.0000	
C	8.79966	0.20071	43.8412	0.0000	
R-squared	0.11232	Mean dependent var		9.7365	
Adjusted R-squared	0.10733	S.D. dependent var		0.5153	
S.E. of regression	0.48695	Akaike info criterion		1.4097	
Sum squared resid	42.2076	Schwarz criterion		1.4452	
Log likelihood	-124.8769	Hannan-Quinn criter.		1.4241	
F-statistic	22.5231	Durbin-Watson stat		0.0711	
Prob(F-statistic)	0.00000				
<b>MODEL</b>	<b>R</b>	<b>R<sup>2</sup></b>	<b>Adjusted R<sup>2</sup></b>	<b>F-stat.</b>	<b>Prob.</b>
S= 8.7997 + 0.5178IR	0.3086	0.1123	0.1073	22.5231	0.0000

(H<sub>0</sub>): No significant relationship between Interest Rate and SENSEX.

(H<sub>1</sub>): Significant relationship between Interest Rate and SENSEX.

In the above table, model shows equation  $S = 8.7997 + 0.5178IR$  is correlated with near about 30%. Here C is constant and its value is 8.7997 meaning that if there is no independent variable or its value is zero then value of BSE-SENSEX is 8.7997. Here the coefficient of Interest rate is 0.5178 that mean BSE-SENSEX will be changed by 51% if Interest rate changes 1% with positive relationship. Here P-value is 0.0000 which implies strongly significant. Interest rate significantly affects BSE-SENSEX. So,

Interest Rate has statistically significant impact on Indian Stock Market.

In this analysis  $R^2 = 0.1123$  that means about 11% of changes in BSE-SENSEX are explained by the change in independent variable Interest Rate. Adjusted R-squared is 0.1073 means model is significantly poor.

**Table 9: Long Run Causality Test Based on VECM: Sensex and Call Rate**

Direction of Causality	ECM t-1	t-Statistics	p-value	Result
Causality from Sensex to Call	-7451.689	-8.5826	0.3993	Unidirectional Causality
Causality from Call Rate to Sensex	-0.0001	-1.2578	0.0000	

The long run causality test based on VECM result presented in above table revealed the long run causal relationship among Sensex and Call Rate. The result showed that the error correction term for co-integrating equation with Sensex as the dependent variable is positive and insignificant at one percent, implying that there exists a no long term relationship running from Call to Sensex. However, the error correction term for co-integrating equation with Call as the dependent variable negative and significant.



It means that there is long run causal relationship running from Call to Sensex. Therefore, we conclude that there is unidirectional causal running from Call to Sensex in long run.

**Table 10: Short Run Causality Test Based on VECM/Block Exogeneity Wald Test: Sensex and Call Rate**

Direction of Causality	Chi-Statistics	p-value	Result
Causality from Sensex to Call Rate	5.1813	0.0750	No Causality
Causality from Call Rate to Sensex	5.5222	0.0632	

The short run causality test based on VECM/Block Exogeneity Wald test result presented in above table revealed short run causal relationship among Sensex and Call Rate. The result showed that there is no causality flowing from any direction between Sensex and Call Rate in short run.

**Table 11: Comparison of Log Run and Short Run Causality Test: Sensex and Call Rate**

Direction of Causality	Long Run Causality	Short Run Causality
Causality from Sensex to Call Rate	No	No
Causality from Call Rate to Sensex	Yes	No

Above table expresses the comparison of short run and long run causal relationship between Sensex and Call Rate. The Sensex does not lead to Call Rate in long run as well as in short run whereas Call Rate leads to Sensex only in long run not in short run.

**Table 12: VECM diagnostics test for Sensex and Call Rate**

Model	1. Sensex = f(Call)			2. Call = f (Sensex)		
	Statistics	P-value	VECM	Statistics	P-value	VECM
<b>Breusch-Godfrey Serial Correlation LM Test</b>	2.5156	0.0837	✓	2.2258	0.1110	✓
<b>Heteroskedasticity Test: ARCH</b>	5.8298	0.0168	×	21.5823	0.0000	×
<b>Jarque-Bera – Normality Test</b>	4.0542	0.1317	✓	3494.577	0.0000	×

The results of diagnostic tests of the estimated VECM are shown in above table. The Breusch-Godfrey Serial Correlation LM Test does not reject the null hypothesis of no autocorrelation in both models. As indicated by the Jarque-Bera – Normality Test first model followed normal distribution but second model does not followed normal distribution. ARCH (Autoregressive Conditional Heteroscedasticity) tests revealed that there is heteroscedasticity problem in both models.

## 12. Conclusion

The interest rate i.e. the call rate, increased between 2004 and 2007 before declining in 2008. It exhibits a notable decline in 2010 (from 7.11 to 3.28), followed by an increase the following year and average movements from 2011 to 2017.

Since the study's primary dependent variable is the Sensex, it is the study's key variable. The Sensex has consistently increased since 2004, rising from 5000 points in 2004 to 21000 points in 2007–2008. However, the Sensex fell precipitously from that level in 2008–09, reaching a trough of about 7000 points. As can be observed, the Sensex has been trending upward with the exception of a few small corrections in 2009–2010. Thus, we can see from the graphical representation that, with the exception

of a few small falling waves in 2015–16, the Sensex exhibits an upward tendency from 2009 to 2018. From 5000 points in 2003–04 to 21000 points in 2007–08, the Sensex begins its upward trajectory. It displays a declining tendency from the peak to approximately 7000 points in 2008–09 and then rises to approximately 37000 points in 2018.

Correlation analysis concludes that SENSEX has been positively related with Interest Rate (Call Rate). From the regression analysis we can conclude that there has been found significant and positive effect of Interest rate on BSE-Sensex. Call Rate is having unidirectional relationship with BSE-Sensex. The Granger Causality Test has been introduced and it shows that in case of Sensex and Interest rate, the uni-direction causal relationship found from Interest rate to Sensex which concludes that Interest rate lead to Sensex but Sensex does not lead to Interest rate.

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