

IMPACT OF INTEREST RATE ON STOCK MARKET PERFORMANCE- NIFTY 50

A DESERTATION REPORT

Submitted By

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ABSTRACTS

This research study aims to investigate the impact of interest rates on the performance of the stock market, with a specific focus on the Nifty indices as a representative of the Indian stock market. Three key interest rate variables, namely Bank rate (repo rate), Base rate, and Reverse repo rate, are considered in the analysis. The study employs Vector Autoregressive (VAR) methods to analyse the relationship between key interest rate variables.

The research employs secondary data from financial sources, such as central banks, stock exchanges, and economic databases, for the analysis. The data cover a substantial time span from August 2017-March 2023, allowing for a comprehensive understanding of the long-term relationship between interest rates and stock market performance.

The findings obtained through VAR modelling contribute to a deeper understanding of the dynamic interactions between interest rates and stock market movements. All the analysis has been done using the statistical software called E-views 10. The results are expected to offer valuable insights to investors, policymakers, and financial institutions, enabling them to make informed decisions and develop strategies to manage market risks effectively. Moreover, to analysis Casual relationship, Long-term relationships different techniques has been used such as granger causality, Variance decomposition, and Johnson cointegration rank test.

By utilizing the VAR approach, this research expands the existing body of knowledge on the influence of interest rates on stock market performance, specifically in the context of the Nifty indices. The study's implications are relevant to the broader economic landscape, offering stakeholders a more nuanced understanding to support prudent financial decision-making.

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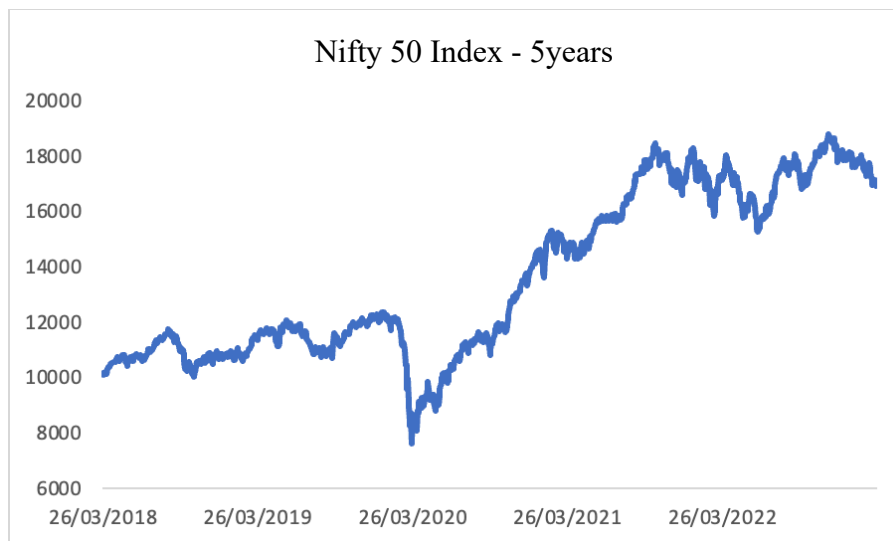
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CHAPTER 1

INTRODUCTION

The major goal of this study is to understand the subtle relationship between interest rates (Repo rate) and the performance of the Indian stock market, with a focus on the Nifty 50 Index. The Nifty 50, as one of India's most important equity indices, serves as a measure of the country's economic health and investor mood. The study aims to determine how interest rate variations affect investor behaviour, market mood, and the overall trajectory of the Nifty 50, eventually giving light on the larger consequences for the Indian economy.



Source: Authors own compilation

Fig 1.1 Nifty 50 – 5 years line graph

This graph represents the line graph for the Nifty 50 indices from August 2017 to March 2023. The graph is gradually increasing with years, but from 2019 end there has been a downfall in the indices because of the economic factor Covid-19. This states all the economic, macroeconomics and microeconomics factors affects the Nifty indices and This study dives at a variety of topics, such as historical trends, macroeconomic indicators, central bank policy, and market reactions. By doing this, Objective intends to deliver a thorough and data-driven research that provides beneficial insights for investors, governments, and financial institutions alike.

The stock market is a highly active sector within the financial system, playing a crucial role in societal progress. It serves as a platform where individuals trade securities like shares, bonds, and debentures. Additionally, it facilitates transactions for various securities and derivatives, serving as a significant marketplace. Moreover, the stock market plays a vital role in aiding companies and entrepreneurs to raise funds for their business endeavours through public offerings. Nowadays, long-term investors prefer the stock market as their investment choice. India's notable stock exchanges include the Bombay Stock Exchange (BSE), National Stock Exchange (NSE), and Calcutta Stock Exchange (CSE) (Bala, A., 2013, Yadav, S., 2017).

Recent monetary policy adjustments have significantly impacted borrowing costs and interest rates, which has caused stock market oscillates (Ak giri et al., 2017; RBI, 2021). However, Limited research on how interest rates especially impact the Nifty and Sensex indexes of the Indian stock market. By undertaking a thorough investigation of the connection between interest rates and the performance of the Indian stock market, this knowledge gap offers a chance to advance both academics and practise. This study seeks to close this knowledge gap and offer insightful information to academics, policymakers, and investors to improve risk management and decision-making in the stock market.

The National Stock Exchange (NSE) is a prestigious organisation with national and global influence. Is a dependable corporate governance entity with a strong market infrastructure. NSE, a domestic brand with a worldwide outlook, is one of the biggest exchanges in the world and a key factor in the expansion of India's economy. The NSE, a pioneer in technology, assures the dependability and performance of its systems via a culture of innovation and investment in technology. (Nse Annual report 2017-18) The NSE was the first exchange in India to use electronic or screen-based trading and started operations in 1994. NSE operates a market ecosystem to increase efficiency & transparency.

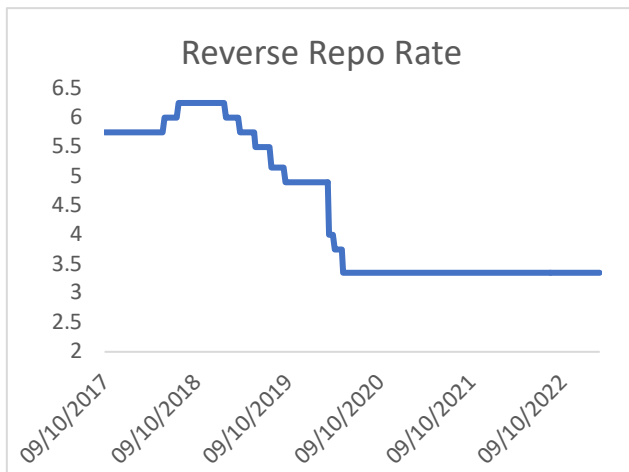
It's robust state-of-the-art technology platform offers high levels of robustness, safety and resilience for trading and investment opportunities across all asset classes and for all categories of investors. NSE is focused on investor protection and disciplined development of the Indian capital market landscape (NSE India). In contrast, that of the BSE — which commands 7.2% share — was just Rs 10.28 trillion with an average of Rs 4,132 crore, down 23.4% since FY22.(Financial Express). On a monthly basis, the NSE recorded an average daily turnover of Rs 68,013 crore during April 2022, the highest for FY23; the lowest was Rs 44,608 crore for June 2022. (Financial Express).



Source: NSE Website

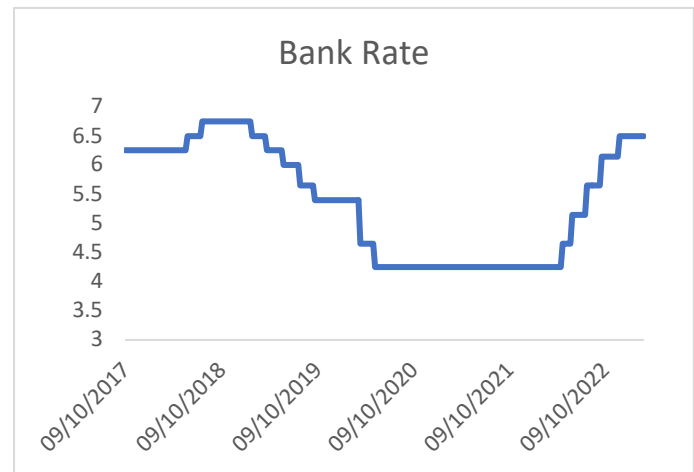
Fig 1.2 Nifty indices logo

Main aim to investigate on NSE. The National Stock Exchange (NSE) is a great place for experienced investors and traders because it offers many types of deals, and lots of trading happens there every day. It has advanced technology and follows rules to keep everything fair. Also, it has a famous index called the Nifty 50 that people pay a lot of attention to. NSE makes it easy to trade in different parts of the economy, and it gives traders the tools they need to be successful in the Indian markets. (Nse India). This study aims to uncover the impact of interest rate variables (base rate, bank rate, reverse repo rate) on the Nifty 50. Through rigorous analysis, we will elucidate the relationship between these rates and stock market performance, contributing to a better understanding of monetary policy's influence on financial markets.



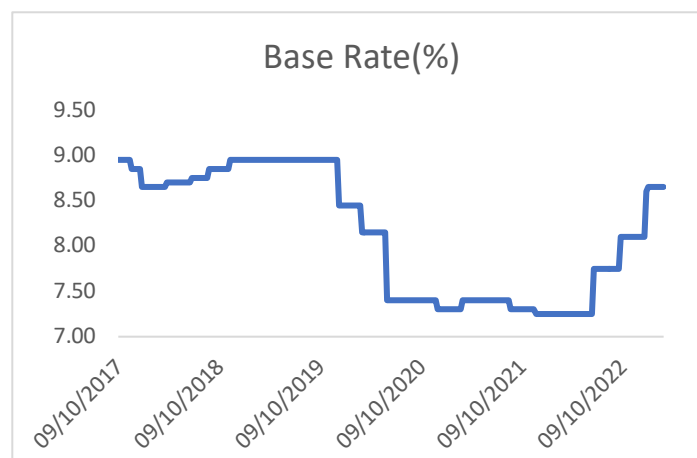
Source: Authors own compilation

Fig 1.3 Reverse Repo rate – 5 years line graph



Source: Authors own compilation

Fig 1.4 Bank Rate – 5 years line graph



Source: Authors own compilation

Fig 1.5 Base Rate – 5 years line graph

Here comes India's federal reserve. In order to ensure financial stability and the robust operation of the financial system and the larger economy, the Reserve Bank is legally required to manage the interest rate and foreign exchange markets. The Reserve Bank is tasked with regulating, developing, and supervising the interest rate markets, including the market for government securities, money markets, including the market for repurchase agreements in government securities and corporate bonds, foreign exchange markets, and derivatives on interest rates/prices, foreign exchange rates, and credit, as part of this mandate. (India, Rbi).

Through the Monetary Policy Committee (MPC) and important policy rates like the repo rate, the Reserve Bank of India (RBI) controls interest rates. The repo rate is changed to alter the cost of borrowing for banks, which has an impact on overall interest rates in the economy. While lowering the repo rate might promote economic development, raising it can make borrowing more expensive and contain inflation. Another tool for controlling liquidity in the banking sector is the reverse repo rate.

This study focuses specifically on analyzing the impact of interest rate factors on the Nifty 50 indices. By examining how changes in interest rates affect the performance of the Nifty 50, the research aims to provide insights into the relationship between these variables, offering valuable information for understanding market dynamics and making informed investment decisions.

CHAPTER 2

LITERATURE REVIEW

Several studies in other nations and India have proven the relationship between interest rates and stock market performance. However, there is minimal research particularly analysing the influence of interest rates on the Nifty and Sensex indexes.

Chen et al., (1986) investigated whether changes in certain economic factors could lead to either risks or rewards in the stock market. They focused on things like interest rates, inflation, production, and bond differences. They found that these risks were indeed important in determining stock prices. Surprisingly, they discovered that the overall market situation and people's spending habits didn't have separate effects on stock prices. They also found that the risk related to changes in oil prices didn't have its own impact on stock prices.

Mishra (2004) explores the connection between stock and foreign exchange markets, considering flow-oriented and stock-oriented models. Empirical studies in developed countries offer mixed results—positive, negative, or weak correlations between stock prices and exchange rates—along with varied causality findings. The Indian context is underrepresented, prompting the study to investigate the dynamic interplay between these markets, addressing this gap and enhancing understanding.

Mathias Binswanger's (2004) study investigates the role of fundamentals in stock markets (US, Japan, Europe) using a structural VAR model from 1960 to 1999. It explores whether real activity shocks explain stock price variations, particularly during the 1980s-1990s stock market booms. The research assesses the impact of speculative bubbles vs. fundamentals on stock prices and the breakdown of traditional stock-return correlations. The SVAR model analyses fundamental and nonfundamental shocks, shedding light on stock price dynamics. The study's structure, data presentation, estimation results, and conclusions are outlined.

Bagliano et al., (2009) The study delves into international co-movements among key real and nominal macroeconomic variables in the US, UK, Canada, Japan, and the Euro-area during the 1980-2005 period. Using a Factor Vector Autoregressive (VAR) approach, the research examines whether these co-movements extend beyond real activity to encompass stock market returns, inflation rates, interest rates, and monetary aggregates. The investigation aims to uncover common sources of shocks and similar transmission mechanisms contributing to these international co-movements. Notably, the study highlights that while real activity is a significant factor, stock market returns, inflation rates, interest rates, and monetary aggregates also play substantial roles in the observed co-movements. Additionally, the analysis explores the origin of global shocks, identifying evidence of both global supply-side and demand-side disturbances. The research employs an extended dataset and a Factor-Augmented VAR model, providing insights into the interplay of various macroeconomic variables across different economies and regions.

Md alam Et al., (2009) found a negative relationship between interest rates and stock prices in both developed and developing countries (Jan 1988 – Mar 2003). In particular, they discovered that a 1% increase in interest rates caused stock values to fall by 0.3% in rich countries and by 0.46% in poor ones. The study also discovered that emerging nations were more affected by interest rates' effects on stock values than were advanced nations. This shows that stock market performance in emerging

nations is more significantly impacted by interest rate increases than in established economies. The authors discovered that depending on the degree of inflation, the link between interest rates and stock prices changed. They discovered a larger negative correlation between interest rates and stock prices in nations with low inflation than they did in those with high inflation.

Aman Srivastava (2010) investigation of the impact of macroeconomic issues on the Indian stock market. Examples of internal macroeconomic pressures include industrial production, the wholesale price index, and borrowing rates. According to a research, interest rates have a significant long-term impact on the Indian stock exchange, but external variables have a less significant impact. This study combines some quantitative and qualitative methods. This discovery is significant because it offers insight into the variables most likely to have an impact on the Indian stock exchange and may be utilised by investors and decision-makers to make wise choices. The study discusses the drawbacks of using asset price theory to impact analysis.

Augustine Addoi et al, (2013) examines the joint influence of interest rates and Treasury bill rates on stock market returns in the Ghana Stock Exchange from 1995 to 2011. Using Johansen's Multivariate Cointegration Model and Vector Error Correction Model, the study establishes cointegration between interest rates, Treasury bill rates, and stock market returns, indicating a long-term relationship. Employing EViews 7 software for Multiple Regression Analysis (OLS), the results show that both Treasury bill rate and interest rate exhibit a negative relationship with stock market returns, although statistical significance is lacking. The study fills a gap in existing literature by considering lending rates as a measure of interest rates, contributing to a more comprehensive understanding of their impact on stock market returns and aiding investors and portfolio managers in making well-informed investment decisions.

BAŞCI et al., (2013) focuses on the intricate relationship between the ISE 100 Index and key macroeconomic variables, utilizing the Vector Autoregressive (VAR) model. By considering variables such as Exchange, Gold, Import, and Export alongside the ISE 100 Index as the dependent variable, the research investigates their interplay. With a dataset spanning from January 1996 to October 2011 and careful treatment of seasonal patterns and stationary properties, the study delves into the dynamic responses of these variables. The analysis employs impulse response analysis and variance decomposition techniques, aiming to uncover the determinants of the ISE 100 Index in the Turkish context. This research contributes to the existing literature on stock market behavior and macroeconomic influences, employing a comprehensive approach to enhance our understanding.

Hamdan Ali (2014) examined the impact of interest rates on stock market performance in Pakistan using data from January 2004 to December 2013. Correlation, Regression analysis and descriptive analysis were run to find out the blow of interest rate on stock market of Pakistan. Here the most influenced factor is Political situations. They found that changes in interest rates had a statistically significant negative effect on stock prices, with a 1% increase in interest rates leading to a 0.67% decrease in stock prices.

Amarasinghe, A.A., (2015) examines the causal relationship between stock price and interest rate in Colombo stock exchange using a Vector Autoregression (VAR) model to analyse the data (2007 – 2013), Data showed that the lagged values of interest rates had a statistically significant effect on stock prices. The results of the Granger Causality test indicated that there was a unidirectional causality running from interest and the study conducted a rolling regression analysis, which confirmed the dynamic nature of the relationship between interest rates and stock prices. The results showed that the

relationship between the two variables varied over time, depending on the prevailing economic conditions.

Barakat, M.R et al., (2015) found relationship between the stock market and macroeconomic factors in two emerging economies (Egypt and Tunisia) for the period from January 1998 to January 2014. The unit root test, the Augmented Dicky Fuller (ADF) test developed by Dicky and Fuller (1981), the Johansen (1988) test, the Vector Auto Regression (VAR) test to determine the best lag length, the co-integration test, and the Granger causality test will all be used to achieve the study's objectives. Mainly include Exchange Rates, Interest Rates, Money Supply and Inflation and Consumer price index (CPI). Explained in most reliable way by (Kim, 2003; Yau & Nieh, 2006; Adrangi et al., 2011; Graham & Harvey, 2001; Rapach et al., 2005). After carefully analysing found that causal relationship found between market index and CPI. Analysis also revealed that the four macroeconomic are co-integrated with the stock market in both countries.

Dewan Muktadir-Al-Mukit (2016) investigated the impact of interest rate and exchange rate on the volatility of the market index (1997 to 2010) at the Dhaka Stock Exchange. They found that interest rates have a significant impact on stock market performance in various economies around the world by using the concept of Cointegration and Error Correction Model and analysis of Variance Decomposition. The research revealed that fluctuations in both interest rates and exchange rates had a notable influence on the market index's volatility. A one percent rise in exchange rates was associated with a 1.04% increase in the market index, while a similar increase in interest rates corresponded to a decrease of 1.71% in the market index. At last Granger causality analysis found existence of unidirectional causality from market index to exchange rate and from interest rate to market index. Overall literature suggesting that interest rates have a significant impact on stock market performance and volatility in various economies around the world.

Singh, G., (2016) examines the connection between macroeconomic factors and stock prices, particularly in the Indian stock market context. The Efficient Market Hypothesis (EMH) claims that macroeconomic factors have little effect on stock returns, however later research undermines this idea by demonstrating significant relations. The Arbitrage Pricing Theory (APT)'s larger conceptual framework acknowledges the cumulative effect of several macro variables on stock prices. Empirical studies in developing nations like India highlight how stock markets are sensitive to changes in the economy and the state of the world. Using co-integration and vector error correction (VAR) models, this study focuses on industrial output, wholesale price index, money supply, exchange rates, and interest rates. The study, which examines data from January 2007 to March 2014, seeks to better understand the dynamics of stock prices on the Indian market and to provide conclusions for decision-makers, investors, and researchers navigating this complex connection.

Khaled Lafi AL-Naif, (2017) provides key information on the relationship between Saudi Arabia's stock market performance and interest rate levels. The findings show that the association is not constant across all nations, with Egypt showing strong negative relationships while Jordan and Oman showed large positive relationships. The Vector Auto Regression, Augmented Dicky Fuller test, Johansen test of cointegration, Granger causality test, and Variance Decomposition are just a few of the econometric tests that were employed in this study. The study also emphasises how crucial it is to take other macroeconomic factors into account when studying stock market performance.

GIRI A. K et al. (2017) investigate the long- and short-term effects of macroeconomic variables on the Indian stock industry between 1974 and 2014. The study found a long-term connection between the

components using the ARDL bounds testing method to co-integration. The study found that whereas economic expansion, pricing, and currency values all have positive effects on stock prices, crude oil prices had the opposite effect. The VECM method showed that economic expansion and FDI had a one-way causal link with the performance of Indian stocks. The variance decomposition analysis revealed that internal shocks account for a large portion of the growth of the Indian stock market. The Indian stock market is significantly impacted by changes in interest rates, according to the statistics. The Indian stock exchange is negatively impacted by financing rates over the long run. This suggests that declining share demand and falling stock prices are the results of higher interest rates.

Naif, K.L., (2017) Examine long term relationship between interest rates and stock market index in Arabian countries (Jordan, Egypt, Oman, Qatar, and Kuwait) with a correlation coefficient of negative. This suggests that when interest rates increase, stock market index tends to decrease. The study also examined the impact of other macroeconomic variables, such as inflation and exchange rates, on the relationship between interest rates and stock market index at ($\alpha < 0.05$ significant level). The author found that inflation had a positive impact on the relationship, while exchange rates had a negative impact. This suggests that changes in these variables may influence the strength of the relationship between interest rates and stock market index in Arabian countries. According to the results of the co-integration test, only Qatar exhibits a long-term link between the interest rate and the stock market index; Jordan, Egypt, Oman, and Kuwait do not.

Dr Pooja Misra (2018) Researchers looked at the connection between India's macroeconomic parameters and the BSE Index from 1999 to 2017. The researchers found long-run causal relationships between the BSE Index and variables including the exchange rate, IIP, interest rates, gold prices, foreign institutional investment, inflation, and money supply using the VECM model. The study found a causal relationship between increasing prices, the money supply, and the BSE Index over the near run. The Granger causality test revealed that fluctuations in the exchange rate had an influence on the BSE Index but not inflation. According to the report, The analysis suggests that the RBI's first objective should be to keep the exchange rate constant, which would improve the performance of the stock market. At various lag times, it was discovered that the Sensex also affected the exchange rate, FII, gold prices, and IIP.

As a conclusion, the literature review found significant and nuanced relationship between Macroeconomic factors and stock market performance, in context of stock market all over the world. And, literature review found direct and indirect impact of interest rate on stock prices, with a consensus emerging on the negative influence of higher interest rates. However, variations are evident across different economies and settings. The literature also highlights the importance of considering other macroeconomic variables, such as GDP growth and foreign institutional investment. Affect the intricate dynamics which influencing stock market behaviour. Furthermore, Different researchers used various econometric methods and models, which include co-integration, vector autoregression (VAR) Analysis, and granger causality tests. This methodology provides valuable insight into short term and long-term interaction between interest rate and stock market indices.

Considering this research, the focus point of our study unequivocally relies on macroeconomic factors, significantly factors those intimately linked to interest rates such as Repo rate, Base rate, Bank rate, Reverse repo rate. By analysing these factors with the stock market performance in the Indian stock market context, research aims to contribute a deeper comprehension of the intricate relationship. Overall, the review of literature emphasises the need for more study to completely comprehend the link between interest rates and stock market performance in the Indian setting.

CHAPTER 3

METHODOLOGY

This study suggests the relationship between Interest rate and stock market performance on Nifty-50. The data set comprise of the 283 weekly data samples from August 2017 – March 2023, which include following Nifty weekly change, Reverse repo rate, Bank rate (Repo rate), Base rate. We found the data from the official federal reserve, Reserve bank of India (RBI) website.

Nifty 50 - Nifty 50 is a benchmark index of the National Stock Exchange of India, comprising 50 large and actively traded Indian stocks representing various sectors.

Reverse repo rate - The reverse repo rate is the interest rate at which the central bank borrows money from commercial banks and other financial institutions, as part of its monetary policy to control the money supply and inflation in the economy.

Bank rate (Repo Rate) - Bank rate is the interest rate at which central banks lend money to commercial banks. It is used to control money supply and credit availability in the economy. A higher rate reduces borrowing and spending, while a lower rate stimulates economic growth.

Base rate - Base rate is the minimum interest rate set by the central bank that serves as a benchmark for commercial banks' lending rates. It influences borrowing costs and economic activity.

All the regression and test has been performed in a specific statistical software called E-views 10. The descriptive statistics summary of the event with the variable can be expressed as

$$LN_t = \beta_0 + \beta_1 LRRR + \beta_2 LRR + \beta_3 LBR + \varepsilon_t \dots\dots\dots (1)$$

LRRR = Log Reverse repo rate

LRR = Log Bank rate (Repo Rate)

LBR = Log Base rate

$\beta, \beta_1, \beta_2, \beta_3, \varepsilon = \beta$ Parameters knows as intercept and slope coefficient and ε is random classic distribution term.

Firstly, need to estimate Descriptive statistics provide a concise summary of data's key features, helping us understand its central tendencies, variability, and distribution. By calculating measures like mean, median, and standard deviation, we gain insights into patterns, outliers, and errors. These stats guide decision-making, reveal trends, and make complex data more accessible to diverse audiences. In research, business, and more, descriptive statistics form the basis for informed analysis and informed choices.

Secondly, need to check the stationarity of the variables, checking for stationarity in time series data is crucial as it ensures that statistical properties remain consistent over time, The Augmented Dickey-Fuller (ADF) test is commonly employed to assess stationarity by testing for the presence of a unit root, indicating non-stationarity. Rejecting the null hypothesis of a unit root suggests stationarity, enabling reliable application of time series analysis techniques for meaningful insights and predictions. Basically, it Compare the current value of the series with the value just before it. If the difference between them

remains stable over time, it suggests that the series is stationary. But if the difference keeps changing a lot, it indicates that the series is not stationary. When assessing data "at level," ADF examines if the raw series is stationary. If p-value < 0.05, it's stationary. In "1st difference," ADF tests changes between observations. If p-value < 0.05, it implies stationary differences. Non-stationarity suggests varying properties over time, impacting accurate analysis and prediction. Transformations are applied if needed to attain stationarity before deeper analysis. In simpler terms if the data is stationary, it implies that the statistical properties of the time series remain constant over time. On the other hand, if the data is non-stationary, it suggests that the statistical properties change over time, often due to trends, seasonality, or other patterns.

Following ADF, test to check the relationship between stock market performance and macroeconomic factors, using regression, Regression is a fundamental statistical and machine learning technique used to model and analyse the relationship between variables. It's used to understand how changes in one or more independent variables are associated with changes in a dependent variable. Regression helps us make predictions, infer patterns, and gain insights from data. This research will be using Vector Autoregressive (VAR), Vector Autoregressive (VAR) is a statistical model used to analyse the relationships between multiple time series variables. It considers how each variable's past values influence its own future values and the future values of other variables in the system. VAR models help understand complex interactions between variables, making them useful for forecasting and assessing causality.

Proceed to construct the correlation matrix operates like a map or a guide that visually represents the interdependencies among different variables. Each cell in the matrix contains a correlation coefficient, typically ranging from -1 to +1. A positive correlation coefficient indicates a direct relationship: as one variable increases, the other tends to increase as well. A negative correlation coefficient signifies an inverse relationship: as one variable increases, the other tends to decrease. A correlation coefficient close to zero suggests a weak or negligible relationship This matrix provides insights into which factors have a stronger pull on the behavior of the other variables, helping us grasp the important connections between them.

Continuing with the analysis, the next step involves conducting the Granger causality test to examine the causal relationship between the interest rates (Reverse repo rate, Bank rate, and Base rate) and the Nifty 50 stock market performance. The Granger causality test determines whether past values of one variable can predict the future values of another variable. To perform the Granger causality test, we consider a lagged regression model. The model assesses whether including lagged values of the interest rates as predictors improves the prediction of Nifty 50's weekly changes. Specifically, the model can be represented as:

$$\text{Nifty}_t = \beta_0 + \beta_1 * \text{LRRR}_{(T-1)} + \beta_2 * \text{LRR}_{(T-1)} + \beta_3 * \text{LBR}_{(T-1)} + \varepsilon_t \dots\dots\dots (2)$$

Nifty_t = Represents the Nifty 50 weekly change at time t.

LRRR_(T-1), LRR_(T-1), and LBR_(T-1) = lagged values of the log-transformed interest rates at time T – 1 .

β₀, β₁, and β₃ = the coefficients associated with the intercept and the lagged interest rates.

ε_t = the error term.

Continuing the analysis, the next step involves conducting the Unrestricted Cointegration Rank Test using the Trace statistic. This test assesses the presence of cointegration among the variables in the system, which indicates a long-term equilibrium relationship. The Unrestricted Cointegration Rank Test (Trace) is a statistical method used to quantitatively assess the presence of a long-term equilibrium relationship between interest rates (Reverse repo rate, Bank rate, Base rate) and Nifty 50 stock market performance. By comparing log-likelihood values across different models, the test determines if these variables are cointegrated. If the test statistic exceeds a critical value, it indicates a meaningful and stable long-term connection between interest rates and Nifty 50, suggesting that changes in interest rates significantly impact the stock market over extended periods. This insight helps us understand the enduring influence of macroeconomic factors on the stock market's behavior.

Next, The Unrestricted Cointegration Rank Test using the Maximum Eigenvalue statistic was conducted to determine if a stable, long-term relationship exists between interest rates variables (Reverse repo rate, Bank rate, Base rate) and Nifty 50 stock market performance. The results reveal the presence of one cointegrating equation at the 0.05 significance level, indicating that changes in interest rates significantly influence the Nifty 50 index over time. This underscores the enduring impact of macroeconomic factors on the stock market's behavior, providing quantitative support for their role in shaping long-term dynamics. Also, act as empirical evidence to guide investment strategies, risk management, and policy adjustments based on meaningful linkages rather than short-term correlations.

Variance decomposition is a statistical method that provides a comprehensive understanding of the factors driving the fluctuations in the NIFTY index. In this context, it sheds light on the extent to which changes in the interest rates, namely BANK_RATE, BASE_RATE_, and REVERSE_REPO_RATE, contribute to the observed variability in the NIFTY index. The analysis offers valuable insights by quantifying the relative importance of each interest rate, revealing how their contributions evolve over different time periods. By identifying the key influencers and providing information on the confidence levels through standard errors, variance decomposition helps uncover the intricate relationship between interest rates and the NIFTY index's movements. This quantitative approach serves as a crucial tool for investors, analysts, and policymakers, providing actionable information to make informed decisions in the dynamic world of the stock market.

CHAPTER 4

EMPIRICAL ANALYSIS

4.1 DESCRIPTIVE STATISTICS

	NIFTY	BANK RATE	BASE RATE	REVERSE REPO RATE
Mean	13353.31	5.382686	8.134452	4.411307
Median	11895.45	5.400000	8.150000	3.350000
Maximum	18696.10	6.750000	8.950000	6.250000
Minimum	8083.800	4.250000	7.250000	3.350000
Std. Dev	2978.366	0.982335	0.694690	1.188000
Skewness	0.407736	-0.006651	-0.094154	0.371891
Kurtosis	1.587227	1.343918	1.260845	1.344621
Jarque-Bera	31.37673	32.34199	36.08391	38.83577
Probability	0.000000	0.000000	0.000000	0.000000

Table: 4(a) Descriptive Statistics

The data shows that NIFTY has a relatively high average (13,353.31) but is right-skewed, with some exceptionally high values. It had a peak of 18,696.10 and a low of 8,083.80, indicating volatility. NIFTY's positive skewness (0.407736) and kurtosis (1.587227) suggest heavier tails, indicating extreme values. The Jarque-Bera probability of 0.000000 confirms its significant non-normality. On the other hand, BANK RATE has a nearly symmetrical distribution, with a mean (5.382686) and median (5.400000) close together. It ranges from 4.250000 to 6.750000, showing stability. The low skewness (-0.006651) and kurtosis (1.343918) suggest a distribution close to normal, but the Jarque-Bera probability of 0.000000 indicates non-normality. Overall, these descriptive statistics offer essential insights into the central tendencies, variability, and distribution properties of the variables, forming a foundation for in-depth analysis and decision-making.

4.2 STATIONARITY TEST

Firstly, before initiating the analysis, Stationarity of the data can be tested using ADF test. Here the null and alternate hypothesis are as follows.

H_0 = Not Stationary,

H_1 = Stationary

ADF (At Level)	NIFTY	BANK RATE	BASE RATE	REVERSE REPO RATE
T -Statistic	-0.667057	-1.016525	-1.145548	-0.745107
Prob	0.8517	0.7480	0.6982	0.8321
1% level	-3.453400	-3.454085	-3.453400	-3.453400
5% level	-2.871582	-2.871883	-2.871582	-2.871582
10% level	-2.572193	-2.572354	-2.572193	-2.572193

Table: 4(b) ADF test result (At level)

Based on the results of the Augmented Dickey-Fuller (ADF) test, which is used to assess the stationarity of time series data, it is found that all four variables, namely NIFTY, BANK RATE, BASE RATE, and REVERSE REPO RATE, exhibit non-stationary behaviour. The ADF test statistics for each variable are negative (-0.667057 for NIFTY, -1.016525 for BANK RATE, -1.145548 for BASE RATE, and -0.745107 for REVERSE REPO RATE), and their corresponding p-values (0.8517 for NIFTY, 0.7480 for BANK RATE, 0.6982 for BASE RATE, and 0.8321 for REVERSE REPO RATE) are greater than the significance levels of 1%, 5%, and 10%. As a result, we fail to reject the null hypothesis, indicating that all the series have unit roots, and therefore, they are non-stationary.

To make the data stationary, Using 1st differencing ADF test.

ADF (1 st Difference)	NIFTY	BANK RATE	BASE RATE	REVERSE REPO RATE
T -Statistic	-15.80321	-3.300094	-16.45299	-3.774055
Prob	0.0000	0.0158	0.0000	0.0036
1% level	-3.453483	-3.454085	-3.453483	-3.454085
5% level	-2.871619	-2.871883	-2.871619	-2.871883
10% level	-2.572213	-2.572354	-2.572213	-2.572354

Table: 4(c) ADF test result (1st Difference)

The ADF test results suggest that all four variables have stationary first differences. The t-statistics for NIFTY, BANK RATE, BASE RATE, and REVERSE REPO RATE are -15.80321, -3.300094, -16.45299, and -3.774055, respectively. These t-statistics are all negative, which indicates the presence of a trend in the first differences of the data. The p-values for all variables are less than 0.05 (in fact, p-values are mentioned as 0.0000, 0.0158, 0.0000, and 0.0036), which means we can reject the null hypothesis of non-stationarity and conclude that the first differences of the data are stationary.

In summary, based on the ADF test results, the data for NIFTY, BANK RATE, BASE RATE, and REVERSE REPO RATE are stationary after taking their first differences. This means any trends or systematic patterns have been removed, making the data suitable for further analysis and modelling.

4.3 GRANGER CAUSALITY TEST RESULT

Null Hypothesis	F-statistic	Probability
REVERSE_REPO_RATE does not Granger Cause NIFTY	4.25379	0.0010
NIFTY does not Granger Cause REVERSE_REPO_RATE	8.35647	2.E-07
BASE_RATE does not Granger Cause NIFTY	1.35805	0.2405
NIFTY does not Granger Cause BASE_RATE	2.27200	0.0478
BANK_RATE does not Granger Cause NIFTY	1.59908	0.1606
NIFTY does not Granger Cause BANK_RATE	6.85452	5.E-06
BASE_RATE does not Granger Cause REVERSE_REPO_RATE	1.78295	0.1165
REVERSE_REPO_RATE does not Granger Cause BASE_RATE	2.00402	0.0784
BANK_RATE does not Granger Cause REVERSE_REPO_RATE	0.07362	0.9961
REVERSE_REPO_RATE does not Granger Cause BANK_RATE	2.53269	0.0292
BASE_RATE does not Granger Cause BANK_RATE	9.14583	5.E-08
BASE_RATE does not Granger Cause BANK_RATE	3.72361	0.0028

Table: 4(d) Granger Causality test result

The Granger Causality Test results unveil the intricate causal relationships among the examined variables. Notably, a significant Granger-causal connection emerges between REVERSE_REPO_RATE and NIFTY, indicating that past changes in REVERSE_REPO_RATE hold predictive power for future movements in the NIFTY index ($F = 4.25379$, $p = 0.0010$). Conversely, NIFTY is found to Granger cause REVERSE_REPO_RATE, reflecting the influence of past NIFTY fluctuations on predicting changes in the REVERSE_REPO_RATE ($F = 8.35647$, $p < 0.0001$).

Meanwhile, the causal interactions between BASE_RATE and NIFTY, as well as NIFTY and BASE_RATE, exhibit relatively weaker significance levels, as reflected by higher p-values ($F = 1.35805$, $p = 0.2405$ and $F = 2.27200$, $p = 0.0478$, respectively). although a stronger causal link is observed in the reverse direction, where NIFTY Granger causes BANK_RATE with higher statistical significance ($F = 1.59908$, $p = 0.1606$ and $F = 6.85452$, $p < 0.0001$, respectively). Interestingly, the strongest causal association is between BASE_RATE and BANK_RATE, where BASE_RATE Granger causes BANK_RATE ($F = 9.14583$, $p < 0.0001$).

4.4 CORRELATION MATRIX

Correlation Matrix	NIFTY	RESERVE REPO RATE	BASE RATE	BANK RATE
NIFTY	1.000000	-0.714669	-0.605464	-0.345387
REVERSE REPO RATE	-0.714669	1.000000	0.873062	0.782481
BASE RATE	-0.605464	0.873062	1.000000	0.878141
BANK RATE	-0.345387	0.782481	0.878141	1.000000

Table: 4(e) Correlation Matrix test result

The correlation matrix provides a comprehensive view of the relationships between NIFTY, the stock market index, and the chosen interest rates: RESERVE REPO RATE, BASE RATE, and BANK RATE. Notably, NIFTY displays distinct negative correlations with each interest rate, revealing potential counteractive movements. Specifically, NIFTY's negative correlation of -0.71 with RESERVE REPO RATE, -0.61 with BASE RATE, and -0.35 with BANK RATE suggests that as NIFTY experiences changes, the associated interest rates tend to react in opposing directions. Additionally, the matrix highlights strong positive correlations among the interest rates themselves, indicating synchronized movements. RESERVE REPO RATE and BASE RATE exhibit a correlation of 0.87, while RESERVE REPO RATE and BANK RATE, as well as BASE RATE and BANK RATE, both demonstrate positive correlations of approximately 0.78 and 0.88, respectively. This intricate interplay among NIFTY and the interest rates underscores the intricate relationships that influence the financial landscape and can guide informed decision-making within the economic context.

4.5 UNRESTRICTED COINTEGRATION RANK TEST (TRACE)

Hypothesized		Trace Statistic	0.05 Critical Value	Prob.** Critical Value
No. of CE(s)	Eigenvalue			
None *	0.150996	65.45120	47.85613	0.0005
At most 1	0.044863	19.61776	29.79707	0.4491
At most 2	0.019258	6.765624	15.49471	0.6050
At most 3	0.004706	1.320677	3.841465	0.2505

Table: 4(f) Cointegration Rank test (Trace) test result

Trace test indicates 1 cointegrating equation(s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values

The Johansen cointegration test was conducted to examine the existence of a long-term relationship among multiple time series variables. The test Produces four sets of results, each representing a different hypothesis about the number of cointegrating equations. The computed trace statistics were 0.150996, 0.044863, 0.019258, and 0.004706, respectively. The critical values at the 5% significance level for each test were 65.45120, 19.61776, 6.765624, and 1.320677. Based on the results, we can conclude that there is at least one cointegrating equation among the variables, indicating the presence of a long-term relationship.

4.6 UNRESTRICTED COINTEGRATION RANK TEST (MAXIMUM EIGENVALUE)

Hypothesized		Max-Eigen Statistic	0.05 Critical Value	Prob.** Critical Value
No. of CE(s)	Eigenvalue			
None *	0.150996	45.83344	27.58434	0.0001
At most 1	0.044863	12.85213	21.13162	0.4659
At most 2	0.019258	5.444948	14.26460	0.6849
At most 3	0.004706	1.320677	3.841465	0.2505

Table: 4(g) Cointegration Rank test (Maximum Eigenvalue) test result

Max-eigenvalue test indicates 1 cointegrating equation(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level.

**MacKinnon-Haug-Michelis (1999) p-values.

The Johansen cointegration test results, focusing on the max-eigenvalue statistic, were used to investigate the presence of a long-term relationship among multiple time series variables. The test produced four sets of results, each representing a different hypothesis about the number of cointegrating equations. The computed max-eigenvalue statistics were 0.150996, 0.044863, 0.019258, and 0.004706, respectively. The critical values at the 5% significance level for each test were 45.83344, 12.85213, 5.444948, and 1.320677. Based on the outcomes, we can conclude that there is at least one cointegrating equation among the variables, indicating the existence of a long-term relationship. The results also suggest that there is no evidence to support the hypotheses of at most one, at most two, or at most three cointegrating equations among the variables.

4.7 THE RESULT OF IMPULSE RESPONSE ANALYSIS

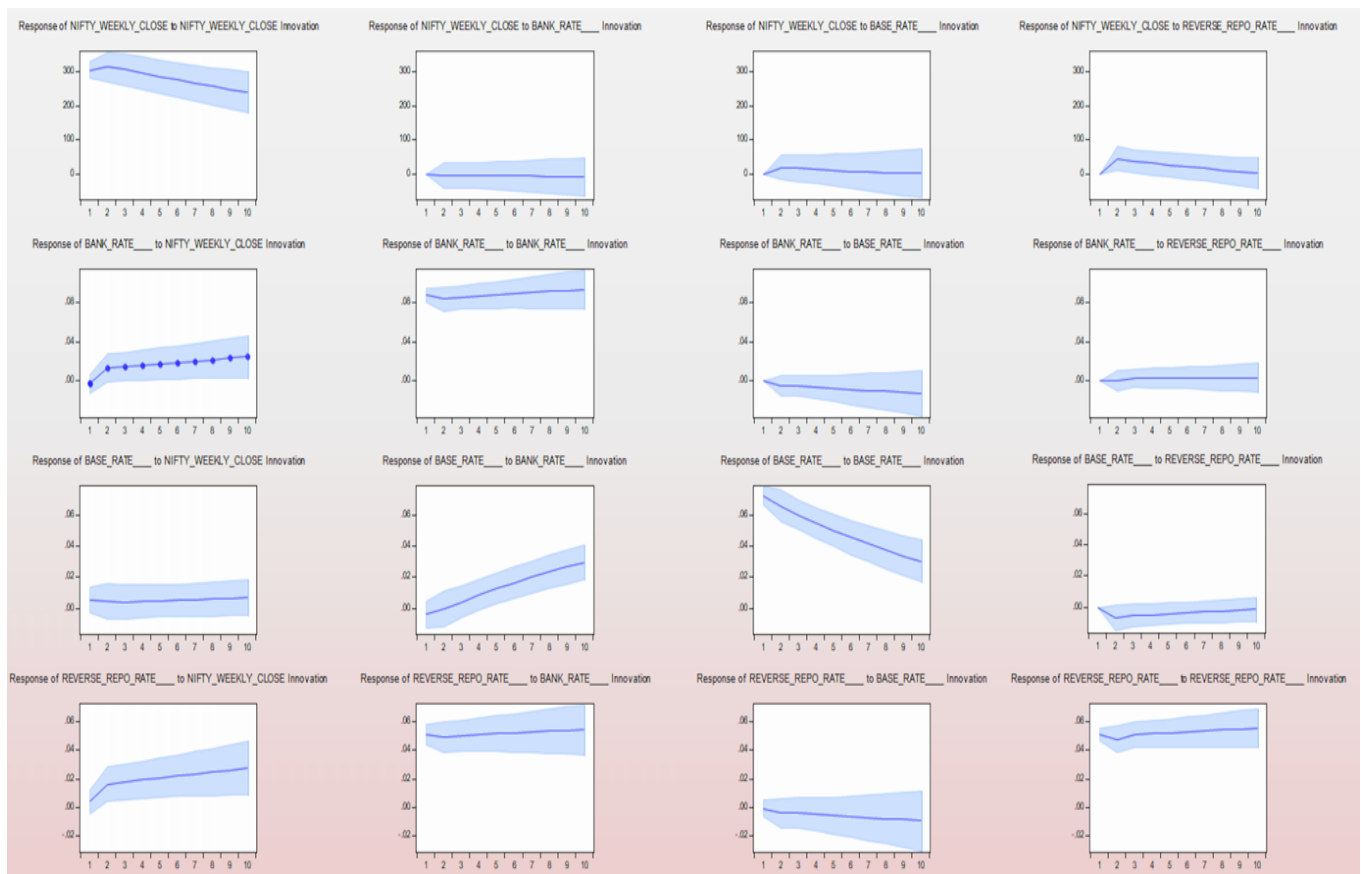


Fig 4.1 Impulse Response analysis graphs

Source: EViews 10

Fig 4.1 Impulse response analysis helps us see how things like Nifty (stock market), base rate, bank rate, and reverse repo rate react with other interest rate variables when something sudden happens. Graphs shows how one thing changing affects the others. This helps us understand how quick changes in these financial things can affect each other and the whole economy.

4.8 VARIANCE DECOMPOSITION

Variance Decomposition NIFTY					
Period	S.E.	NIFTY	BANK_RATE	BASE_RATE	REVERSE_REPO_RATE
1	305.1073	100.0000	0.000000	0.000000	0.000000
		(0.00000)	(0.00000)	(0.00000)	(0.00000)
2	440.3260	98.68231	0.007377	0.199244	1.111065
		(1.19447)	(0.18925)	(0.48292)	(1.02394)
3	537.6824	98.53115	0.009325	0.236181	1.223344
		(1.42744)	(0.24510)	(0.62562)	(1.24327)
4	614.6387	98.53440	0.011200	0.234480	1.219924
		(1.52735)	(0.28307)	(0.69062)	(1.34334)
5	678.4360	98.59948	0.013215	0.220862	1.166440
		(1.55960)	(0.31641)	(0.72550)	(1.37766)
6	732.8001	98.68556	0.015746	0.204161	1.094529
		(1.57072)	(0.35477)	(0.75458)	(1.38375)
7	779.9530	98.77624	0.019029	0.187638	1.017089
		(1.58049)	(0.40280)	(0.79107)	(1.37299)
8	821.3579	98.86308	0.023292	0.172569	0.941059
		(1.60284)	(0.46247)	(0.84334)	(1.35166)
9	858.0457	98.94108	0.028772	0.159405	0.870741
		(1.64661)	(0.53390)	(0.91521)	(1.32281)
10	890.7796	99.00690	0.035721	0.148224	0.809151
		(1.71670)	(0.61619)	(1.00678)	(1.28847)

Table: 4(h)Nifty – Variance Decomposition

The table 4(h) shows how different interest rates impact the NIFTY stock market index's fluctuations over time. Initially, rates have minimal influence, but "BASE_RATE_" and "REVERSE_REPO_RATE" become more significant contributors in later periods. The values in parentheses indicate confidence levels. This analysis quantifies the relationships between interest rates and NIFTY changes.

The variance decomposition table 4(i) provides a quantitative breakdown of the influence of different interest rates on the variation in the NIFTY stock market index across several periods. Initially, during the first period, the "BANK_RATE_" factor has almost no impact, while subsequent periods reveal that "BASE_RATE_" and "REVERSE_REPO_RATE" gradually contribute more to the fluctuations. The numbers in parentheses signify the level of certainty in these findings. This analysis quantifies the changing relationship between these interest rates and their role in driving NIFTY's changes over time.

Variance Decomposition of BANK RATE					
Period	S.E.	NIFTY	BANK RATE	BASE RATE	REVERSE REPO RATE
1	0.088218	0.153374	99.84663	0.000000	0.000000
		(0.61657)	(0.61657)	(0.00000)	(0.00000)
2	0.122642	1.142057	98.62790	0.227603	0.002442
		(1.40918)	(1.51900)	(0.47961)	(0.24092)
3	0.150451	1.629105	98.04228	0.297652	0.030961
		(1.99407)	(2.14910)	(0.58112)	(0.29590)
4	0.174733	2.019098	97.55594	0.384682	0.040277
		(2.37503)	(2.56115)	(0.69513)	(0.35451)
5	0.196781	2.358253	97.11456	0.479178	0.048008
		(2.66658)	(2.87492)	(0.82018)	(0.40335)
6	0.217274	2.674863	96.69217	0.579332	0.053634
		(2.92260)	(3.14745)	(0.96427)	(0.44548)
7	0.236607	2.979968	96.27904	0.683181	0.057814
		(3.16496)	(3.40219)	(1.12416)	(0.48468)
8	0.255037	3.278807	95.87113	0.789277	0.060782
		(3.40427)	(3.65055)	(1.29634)	(0.52274)
9	0.272737	3.573961	95.46686	0.896483	0.062696
		(3.64554)	(3.89811)	(1.47717)	(0.56090)
10	0.289835	3.866711	95.06572	1.003898	0.063672
		(3.89100)	(4.14748)	(1.66358)	(0.59991)

Table: 4(i)Bank Rate – Variance Decomposition

Variance Decomposition of BASE RATE					
Period	S.E.	NIFTY	BANK RATE	BASE RATE	REVERSE REPO RATE
1	0.072999	0.579931	0.281581	99.13849	0.000000
		(1.09940)	(0.68267)	(1.37378)	(0.00000)
2	0.098790	0.553636	0.155935	98.80193	0.488498
		(1.15793)	(0.80887)	(1.52013)	(0.62454)
3	0.116121	0.536662	0.245241	98.63911	0.578990
		(1.23345)	(0.71523)	(1.51297)	(0.74788)
4	0.129045	0.555729	0.645333	98.18246	0.616478
		(1.32779)	(0.77310)	(1.59199)	(0.82438)
5	0.139258	0.595273	1.389572	97.39230	0.622854
		(1.42190)	(1.08802)	(1.80021)	(0.86343)
6	0.147677	0.651030	2.495382	96.23967	0.613922
		(1.52081)	(1.59149)	(2.16226)	(0.88715)
7	0.154881	0.721657	3.966169	94.71607	0.596108
		(1.62466)	(2.22073)	(2.66713)	(0.90140)
8	0.161262	0.806974	5.792566	92.82741	0.573050
		(1.73442)	(2.94157)	(3.28908)	(0.90946)
9	0.167103	0.907195	7.952829	90.59293	0.547048
		(1.85066)	(3.72715)	(3.99673)	(0.91308)
10	0.172608	1.022588	10.41401	88.04370	0.519700
		(1.97389)	(4.55154)	(4.75804)	(0.91365)

Table: 4(j) Base rate – Variance Decomposition

The variance decomposition in table 4(j) analysis of "BASE_RATE" shows that initially, stock market changes ("NIFTY") and the central bank's lending rate ("BANK_RATE") had a strong impact. As time

passed, the base rate's own influence increased, and the "REVERSE_REPO_RATE" became more significant in explaining variations. This offers insights into the changing factors driving base rate fluctuations.

Variance Decomposition of REVERSE_REPO_RATE					
Period	S.E.	NIFTY	BANK_RATE	BASE_RATE	REVERSE_REPO_RATE
1	0.072446	0.328929	49.74484	0.005590	49.92064
		(0.91424)	(4.03005)	(0.20811)	(4.05366)
2	0.101428	2.846997	49.16690	0.141018	47.84508
		(2.27489)	(4.86768)	(0.56152)	(4.81442)
3	0.125608	3.929022	48.09212	0.180806	47.79805
		(2.81510)	(5.42401)	(0.67203)	(5.27598)
4	0.146475	4.683458	47.51678	0.234522	47.56524
		(3.16272)	(5.82534)	(0.79495)	(5.63174)
5	0.165375	5.287713	47.06787	0.295011	47.34941
		(3.40922)	(6.14567)	(0.92404)	(5.90891)
6	0.182900	5.819487	46.68621	0.360340	47.13397
		(3.62042)	(6.43798)	(1.06969)	(6.15412)
7	0.199408	6.310283	46.33801	0.428859	46.92285
		(3.81864)	(6.72094)	(1.22856)	(6.38287)
8	0.215125	6.775637	46.00809	0.499392	46.71688
		(4.01589)	(7.00252)	(1.39765)	(6.60309)
9	0.230206	7.223875	45.68847	0.571032	46.51663
		(4.21752)	(7.28576)	(1.57384)	(6.81863)
10	0.244761	7.659764	45.37475	0.643070	46.32242
		(4.42589)	(7.57152)	(1.75464)	(7.03151)

Table: 4(k) Reverse repo rate – Variance Decomposition

The analysis of "REVERSE_REPO_RATE" variance over time shows that initially, stock market changes ("NIFTY") and the central bank's lending rate ("BANK_RATE") had a notable impact on fluctuations. However, as time progressed, the reverse repo rate itself became a more dominant factor in explaining its changes, with diminishing influence from "NIFTY" and "BANK_RATE." This sheds light on how the reverse repo rate dynamics evolve over different periods.

In conclusion, the variance decomposition analyses provide valuable insights into how various interest rates impact the NIFTY stock market index's fluctuations over different time periods. Initially, the influence of these rates is limited, but as time advances, both the "BASE_RATE_" and "REVERSE_REPO_RATE" become more significant contributors to the NIFTY's movements. These findings quantify the evolving relationships between interest rates and NIFTY changes, shedding light on the changing dynamics that drive these fluctuations over time.

CHAPTER 5

RESULT AND CONCLUSION

In summary, the comprehensive analysis of the relationships between the NIFTY stock market index and various interest rate factors has provided valuable insights into the intricate dynamics of the financial landscape. Key findings from this study include:

Causal Relationships: Granger causality tests have revealed significant causal connections among the variables. Notably, a bidirectional causal link exists between REVERSE_REPO_RATE and NIFTY, suggesting that past changes in the reverse repo rate can predict future movements in the NIFTY index, and vice versa. Similarly, there are causal relationships between NIFTY and other interest rates, albeit with varying degrees of significance.

Correlation Insights: The correlation matrix has shown distinct negative correlations between NIFTY and each of the chosen interest rates. This negative correlation suggests that as NIFTY experiences changes, the associated interest rates tend to respond in opposing directions. Additionally, strong positive correlations between the interest rates themselves imply synchronized movements, underscoring the complex interplay within the financial system.

Long-Term Relationship: The Johansen cointegration test results, based on both trace statistics and max-eigenvalue statistics, have consistently indicated the presence of at least one cointegrating equation among the variables. This suggests the existence of a stable long-term relationship between the NIFTY index and the selected interest rates.

Changing Impact Over Time: The variance decomposition analyses have revealed evolving patterns in the impact of different interest rates on NIFTY's fluctuations over time. Specifically, BASE_RATE and REVERSE_REPO_RATE have gained significance as contributors to NIFTY's variations in later periods, indicating shifting economic conditions and market dynamics.

In conclusion, this comprehensive study underscores the intricate relationships between the NIFTY stock market index and various interest rate including bank rate, Base rate, Reverse repo rate. The findings have significant implications for investors, policymakers, and analysts alike, offering insights into the predictive power of interest rate changes on stock market movements and vice versa. The confirmed long-term relationship between these variables provides a foundation for understanding the broader economic context and guiding strategic decision-making. As financial markets continue to evolve, these insights will prove valuable in navigating the complexities of the financial landscape.

Further Research study

Further research in this area can expand on the foundation established by this study to examine new angles and improve our understanding of the connection between interest rates and stock market performance, with a special focus on the Nifty indexes. Here are some potential paths for more research.

The dynamic interaction between interest rates, regulatory policies, and market behavior continues to captivate researchers, investors, and policymakers. Expanding on the prior study's insights, there's a compelling opportunity to deepen our understanding within the Nifty indices and the Indian stock market. As finance evolves, considering factors like Statutory Liquidity Ratio (SLR), Cash Reserve Ratio (CRR), and the Arbitrage Pricing Theory (APT) offers a natural progression. These factors provide a comprehensive lens into how regulatory tools impact liquidity and credit availability, shaping the Nifty indices' movements. Some of the potential questions are as follows.

- 1) How does the inclusion of SLR (Statutory Liquidity Ratio) and CRR (Cash Reserve Ratio) in the analysis enhance our understanding of the impact between interest rates and stock market performance in the context of the Nifty indices?
- 2) To what extent does the application of the Arbitrage Pricing Theory (APT) improve our comprehension of the factors influencing the Nifty indices behavior, beyond interest rates? How do these additional determinants interact with interest rate changes?
- 3) How do variations in interest rates—more specifically, base, bank, and reverse repo rates—affect the performance of various Nifty 50 index sectors? Are some industries more susceptible to interest rate changes than others, and how do these industry-specific responses affect the Nifty 50 index's overall movement?"

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