The Impact of Repo Rates and Reverse Repo Rates on GDP Growth and Inflation: Empirical Evidence from India

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SADIRA FERNANDES

Seat Number: 42-2022

ABC ID: 616847347294

PRN: 201909364

Under the Supervision of

Prof. GUNTUR ANJANA RAJU

Goa Business School

Commerce Discipline

GOA UNIVERSITY

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DECLARATION BY STUDENT

I hereby declare that the data presented in this Dissertation report entitled, **"The Impact of Repo Rates and Reverse Repo Rates on GDP Growth and Inflation: Empirical Evidence from India"** is based on the results of investigations carried out by me in the Discipline of Commerce at the Goa Business School, Goa University/College under the Supervision of Prof. Guntur Anjana Raju and the same has not been submitted elsewhere for the award of a degree or diploma by me. Further, I understand that Goa University or its authorities will not be responsible for the correctness of observations / experimental or other findings given the dissertation.

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Date: 30/04/2024

Prof. Guntur Anjana Raju

Signature of Dean of the school:

Date: 30/4/2024

Place: Goa University

Goa Business School ★ Goa University ★

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LIST OF ABBREVIATION

GDP	Goss Domestic Product
RBI	Reserve Bank of India
LAF	Liquidity Adjustment Facility
ADF	Augmented Dickey-Fuller
OLS	Ordinary Least Square
VAR	Vector Autoregression
TYDL	Toda-Yamamoto Causality test

ABSTRACT

The Reserve Bank of India, the nation's central bank, is responsible for developing, implementing, and overseeing the country's monetary policy. India's financial system is centered on the RBI, which was founded to preserve reserves to ensure monetary stability. The main purpose of this research paper is to study the impact of policy rate instruments of Repo Rate and Reverse repo rates on the GDP Growth rate and Inflation. The study aims to investigate the causal relationship between Repo rates, Reverse Repo rates, GDP Growth, and Inflation. Using time series data spanning over a two-decade period 2003-2023, the Toda-Yamamoto Causality test is being employed to uncover the dynamic causal interactions between these variables. Through a combination of quantitative analysis and exploration of existing literature, the study aims to provide a comprehensive understanding of the relationship between Repo rates, Reverse Repo rates, GDP Growth, and Inflation in the Indian context.

KEYWORDS: Repo Rates, Reverse Repo rates, GDP Growth, Inflation, and Toda-Yamamoto Causality test.

CHAPTER 1: INTRODUCTION

1.1 Introduction to Repo rates, Reverse Repo rates, GDP Growth and Inflation

The Reserve Bank of India drafts policies, that are implemented in this nation, and are very crucial in regulating and controlling Inflation and promoting and increasing GDP Growth and price stability in India. One of the most important factors influencing a nation's economic growth and stability is its monetary policy framework. Few threads are as important as repo rates and reverse repo rates in the complex web of monetary policy. How the balance of economic stability is maintained are these policy tools that central banks employ. They affect borrowing prices, liquidity circumstances, and eventually the direction of inflation and economic growth. Their influence is felt and resonated throughout the financial markets.

The money supply in the economy can be managed by several monetary policy tools, including cash reserve ratios and open market operations. Credit ceiling, credit authorization system, bank rate policy, moral suasion, repo rate, reverse repo rate, and statutory liquidity ratio. The Reserve Bank of India (RBI) and other central banks of different nations deploy a range of instruments to control the flow of credit and money throughout the economy, with the ultimate goal of accomplishing macroeconomic goals including stable prices, full employment, and steady economic expansion. Repo rates and reverse repo rates are important policy tools that have a big impact on the dynamics of inflation and GDP growth among these tools. In this highly developed nation, the Reserve Bank of India's policies have a major impact on maintaining price stability and GDP growth through managing inflation.

During the period from early 1990s to 2009, the Indian economy was showcased as a financially repressed economy characterized by high statutory pre-emption, sectoral credit targets, administered interest rates, and fiscal dominance. RBI monetary policy and financial sector reforms were comprehensively undertaken by the government of India. As a result, the

financial repression was progressively undone, interest rates were deregulated, fiscal dominance reduced, the banking sector was liberalized, financial markets and money markets developed, Indian financial sector emerged as a modern and market-oriented system during the 2000s. In April 1999, the RBI implemented a liquidity adjustment Facility in response to the recommendations made by the Narasimhan Committee on Banking Sector Reforms (1998). By the policy directives released in June 2000, the RBI established a comprehensive Liquidity Adjustment Facility. Subsequent changes were carried out in 2001 and 2004. October 2004 saw the announcement of a redesigned LAF scheme and the adoption of worldwide terminology usage. Since then, the RBI's monetary policy has made the repo rate a major policy rate (Bahlerao, 2017)

1.2 Relationship Between Repo Rates and Reverse Repo Rates on GDP Growth And Inflation

Repo rates, reverse repo rates, GDP growth, and Inflation have a dynamic and intricate relationship that is influenced by several feedback loops and variables. “The interest rates at which the central bank loans money to commercial banks are referred to as repo rates or repurchase rates”. Conversely, “the interest rates at which banks lend money to the central bank are known as reverse repo rates”. The economy as a whole is significantly impacted by both of these rates. They have an impact on consumer and commercial borrowing costs as well as the liquidity of the banking system. The term GDP, or gross domestic product, “refers to the total worth of all products and services generated inside the boundaries of a nation”. It's similar to taking the economic pulse and indicating how prosperous a nation is. Conversely, “inflation denotes the progressive rise in the costs of goods and services over some time”. It may affect things like people's purchasing power and cost of living. Inflation and GDP have a lot in common and can have a big impact on an economy. By affecting borrowing and

investment activity, changes in the repo and reverse repo rates can affect GDP. Furthermore, they may impact inflation by altering borrowing costs, which in turn may impact consumer spending. Reducing interest rates can stimulate investment and borrowing, increasing GDP. On the other hand, increasing rates can reduce inflation by increasing the cost of borrowing. Because the repo rate is essential to managing the cash flow in the market, it has a significant effect on a nation's economy. The Indian monetary policy controls and adjusts the repo rate based on market liquidity and inflation cash flow. Furthermore, the repo rate has a direct impact on banks' capacity to borrow funds. Banks' ability to borrow money declines when the repo rate rises, which reduces industry output capacity, drives up the price of necessities and contributes to joblessness. The nation's inflation is mostly controlled by repo rates. For example, the RBI may increase the repo rate in response to excessive inflation, which will decrease the quantity of money in circulation. The reduction in cash flow leads to a decrease in production capacity and investment, ultimately lowering the rate of inflation. RBI encourages banks to borrow money since, conversely, it only lowers the repo rate in response to a decrease in inflation. Interest rates on loans from commercial banks and the RBI's repo rates are proportionate to one another. Interest rates on loans will rise if the repo rates rise, and vice versa. Increases in reverse repo rates encourage commercial banks to deposit more money with the RBI, which reduces the amount of money available for purchase in the market. The money supply will decrease in response to an increase in the reverse repo rate and vice versa. Due to the increase in Repo and Reverse Repo, India's growth rate has decreased, while its inflation and unemployment rates have increased (Sandeep & Ch, 2022) Moreover, the correlation among repo rates, reverse repo rates, GDP growth, and inflation is dynamic, changing over time and according to various economic conditions. Central banks may take an accommodating position during economic expansions, lowering and reversing repo rates to encourage borrowing and investment and increase GDP growth. But during

recessions or periods of increased inflation, central banks can adopt a more aggressive posture, hiking repo and reverse repo rates in an effort to control inflation and avoid an overheating of the economy. Understanding the effects of repo rates and reverse repo rates on GDP growth and inflation demands a thorough and diverse approach in light of these complex relationships and policy trade-offs.

1.3 Trends in Repo Rates and Reverse Repo Rates for Two Decades (Jan 2003 to Sept 2023)

Figure 1.1 Trends in Repo rate(%)

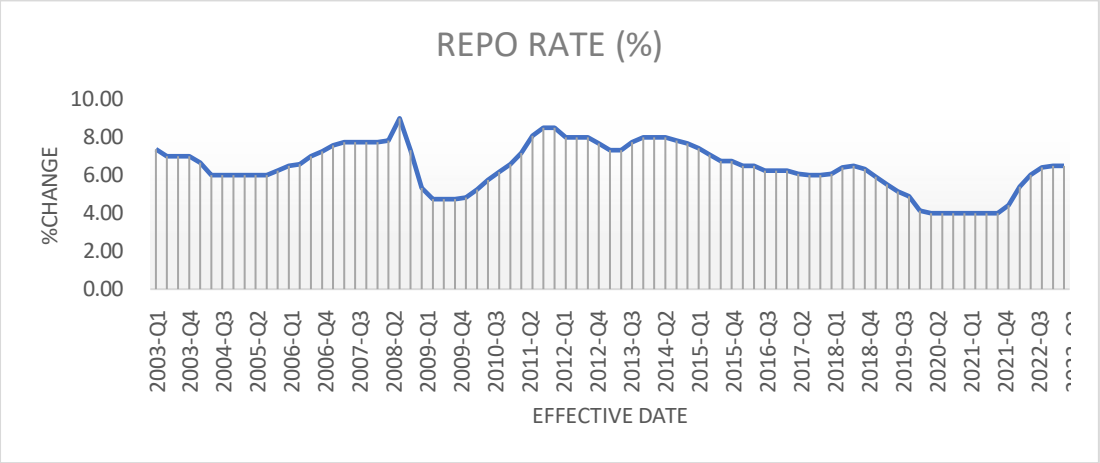
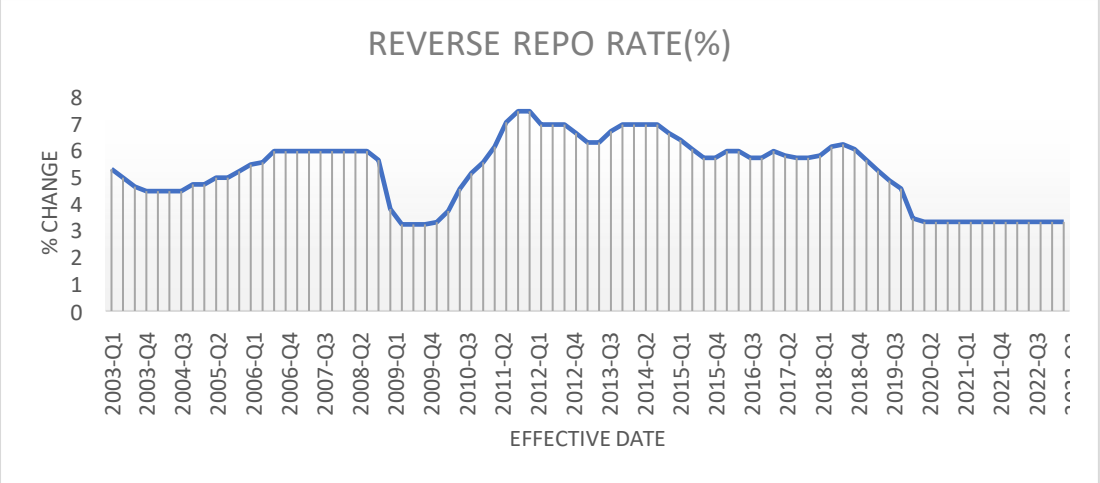


Figure 1.2 Trends in Reverse Repo rate(%)



Source: RBI and authors compilation

INTERPRETATION:

The trend analysis reveals regular fluctuations in both the repo rates and the reverse repo rate. The fact that the repo was significantly raised between 2011 and 2014 suggests that the central bank is attempting to tighten monetary policy in an effort to rein in inflation. The fact that the reverse repo rate increased steadily between 2011 and 2014 indicates that the central bank was attempting to take up extra liquidity in the banking sector. India had significant rates of inflation in the years starting in 2011, which were mostly caused by supply-side restrictions and rising global commodity prices, especially for crude oil. The RBI decided to raise and reverse the repo rate in order to combat inflation and preserve price stability. The repo rates and reverse repo rates were decreased in the year 2020 to 2022 during the Covid 19 period.

1.4 Importance of the study

1. In relation to monetary policy and its effects on the economy, it is critical to stress the importance of investigating the effects of Repo rates and Reverse Repo rates on GDP and Inflation.
2. To comprehend the effects of adjustments to Repo and Reverse Repo rates on GDP Growth and Inflation and to offer perspectives on the efficiency of monetary policy in shaping economic results. Policymakers can use this information to inform their actions and assist in stabilizing the economy.
3. Analysing the connections between GDP growth, Inflation, Repo rates, and Reverse Repo rates can help us comprehend the elements that support economic stability. The sources of inflation and economic growth can be identified, and then policies can be put in place to encourage stability and reduce possible threats.

4. The study's conclusions may have applications for central banks and policymakers. It can help them determine the right interest rate policies to implement in order to accomplish particular economic goals, like promoting growth or reining in inflation.

1.5 Scope of the study

1. Analysing historical data on Repo rates, Reverse Repo rates, GDP Growth, and Inflation.
2. Examining the connection between macroeconomic factors like GDP growth and inflation and monetary policies like Repo rates and Reverse Repo rates.
3. To concentrate on a two-decade timeframe, which enables a thorough examination of the long-term trend.

1.6 Objectives of the study

1. To Examine the Impact of Repo Rates and Reverse Repo Rates on Real GDP Growth and Inflation.
2. To Analyse the Causality of Repo Rates and Reverse Repo Rates on Real GDP Growth and Inflation.

1.7 Research Questions

To find out the impact and relationship between repo rates and reverse repo rates, the following questions have been formulated:

1. What is the relationship between changes in repo rates and reverse repo rates and their impact on GDP and Inflation in India?

2. What is the causal relationship between RBI Repo rates, Reverse Repo rates and GDP and Inflation in India?

1.8 Research hypothesis

1. There is a significant impact of RBI Repo rates and Reverse repo rates on GDP Growth and Inflation in India
2. There is a significant causal relationship between RBI repo rates and Reverse repo rates on GDP Growth and Inflation in India.

1.9 Chapterization Scheme:

The Chapterization scheme followed by the study is as follows:

Chapter 1: Introduction to Repo Rate, Reverse Repo Rate, GDP Growth and Inflation

The introductory chapter makes a brief introduction to the topic that is Repo rates and Reverse repo rates and how they impact Real GDP Growth and Inflation, trends in repo rates and reverse repo rates, importance, scope, objectives and hypothesis

Chapter 2: Review of Literature

The review of the literature presents the importance of repo rates and reverse repo rates as policy rates and how they impact macroeconomic variables such as GDP and Inflation. It also helps us to know the relationship between the variables.

Chapter 3: Research Methodology

The third chapter deals with the problem of the study, research gap, data sources, data period, descriptive statistics, unit root test, correlation, regression and Toda-Yamamoto test

Chapter 4: Data Analysis and Conclusion

The final chapter summarises the discoveries made during the investigation. Based on the findings, conclusions are being drawn, and pertinent suggestions are being made.

CHAPTER 2: REVIEW OF LITERATURE

2.1 Introduction

The effectiveness of monetary policy is tested through its ability to achieve the final objectives of growth and price stability. An extensive literature examines the impact of monetary policy instruments such as repo rates and reverse repo rates on GDP growth and Inflation in India. Over the years, numerous studies have delved into the multifaceted impacts of monetary policy tools on various macroeconomic indicators. The literature review in this research helps us to find out how the instruments of monetary policies which are repo rates and reverse repo rates have impacted the Indian economy over the years.

2.2 Overview of Monetary Policy and its Importance in India

(Nehra, 2015) and (Himani, 2014) highlight the indisputable and changing effects and dynamic influence of monetary policy on the Indian economy following the period of post reform era. The analysis underscores the growing significance of monetary policy and how crucial it is across history in accomplishing goals like price stability and economic expansion. It highlights how important monetary weapons like the bank rate, CRR, SLR, repo rate, and reverse repo rate, with repo and reverse repo rates becoming as crucial tools for controlling inflation and liquidity in the economy and enhancing the GDP Growth. In the Indian economy, achieving price stability as compared to other long-term development goals short term development is more successful than other long-term growth goals.

2.3 Relationship between Monetary Policy, GDP Growth and Inflation

A wealth of information about the dynamics of central bank activities and their effects on the economy can be found in the literature on the relationship between monetary policy and macroeconomic variables, specifically inflation, GDP growth. In order to provide insight into

the connection between monetary policy and important economic indicators in India, this study summarises the results noteworthy research by (Ahmad, 2014), (Chanyal, 2018) , (Kaur et al., 2020), and others.

The study conducted by (Ahmad, 2014) offers empirical data regarding the noteworthy impact of monetary policy modifications on GDP growth and inflation in India. Ahmad stresses how crucial it is to comprehend how policy rates interact with macroeconomic results. The results imply that decision-makers and researchers can use these findings to better explore the ramifications of monetary policy and make informed decisions. Three main channels via which changes in the repo rate impact the actual economy are the interest rate channel, the credit channel, and the exchange rate channel. The RBI shapes consumption, investment, and exports by modifying the repo rate, which also affects lending rates, credit availability, and exchange rates.

Consistent with Ahmad's conclusions, (Chanyal, 2018) investigates the transmission mechanism of monetary policy, specifically through the repo rate in India, and highlights the significance of taking into account the effects of repo rate hikes on lending rates and borrowing costs for consumers and businesses and also emphasizes the connection between the operations of the central bank and the lending rates of commercial banks, stressing that fluctuations in the repo rate affect the cost of borrowing for banks as well as for consumers. This realization highlights the complex interplay between policy rates and actual lending practices, providing context for discussions on how well monetary policy tools affect economic activity.

With an emphasis on both short- and long-term dynamics, (Kaur et al., 2020) investigate the more general effects of monetary policy on growth. As demonstrated by variations in unemployment rates, their research highlights the systemic effect of monetary policy on a nation's competitiveness. Through their analysis of the complex consequences of monetary

policy, Kaur et al. add to our understanding of how policy shapes the economy and highlight the importance of taking a comprehensive approach to policymaking.

Taken as a whole, these studies contribute to a better understanding of the intricate relationship that exists between monetary policy decisions and the macroeconomic results of the Indian economy. They provide insightful information for practitioners, researchers, and policymakers alike by utilizing a variety of approaches and concentrating on various aspects of the transmission of monetary policy. This helps to inform future research endeavors and promotes informed decision-making.

2.4 Challenges and Influence of Policy Rates on Inflation Targeting and GDP Growth

(Sadaf Karim, 2023) explores the difficulties associated with monetary policy transmission and inflation targeting. Specifically, he looks into how changes in repo rates affect inflation targeting in India, especially when it comes to inefficient channels. The research indicates that although the repo rate is an important policy rate, its influence on inflation indices is not as great as it could be. To improve the effectiveness of interest rate policies in affecting demand and price dynamics, more research is necessary as this raises concerns regarding the efficiency of monetary policy transmission mechanisms.

(Sandeep & Ch, 2022) examine how changes in the repo rate affect the productivity of industries and the unemployment rate. They also draw attention to the difficulties in regulating inflation and the efficacy of policy. The paper clarifies how changes in repo and reverse repo rates affect the money supply and currency movement, highlighting the crucial role that the RBI plays in adjusting interest rates to control inflationary pressures.

(Madhu & Archana, 2023) investigate how repo and reverse repo rates affect inflation and growth, highlighting the effects of interest rate manipulation on economic factors including

investment and purchasing power. An increase in interest rates also results in an increase in the cost of capital, which slows down economic investment. More money is available in the economy and people have more purchasing power when interest rates are lower. The paper explains how changes in interest rates impact purchasing power, investment choices, and the cost of capital, which in turn impacts the economy's growth and inflationary results.

The combined effect of these studies emphasises how complex inflation regulation and monetary policy are and how they influence the drafting policy measures. They also stress the significance of taking into account the larger economic backdrop, resolving issues with policy transmission channels, and comprehending the effects of fluctuations in these rates on different economic sectors. The promotion of stable and sustainable economic growth ultimately requires a complex approach to monetary policy and inflation targeting.

2.5 Cross Country Comparison

The effect of modifications to the repo mechanism on the South African money market was examined by (Fadiran & Edun, 2013). After comparing the pre-repo and repo periods, they discovered that the repo period yielded superior outcomes with less interest rate volatility. This shows that policymakers were successful in changing the repo system and emphasizes the repo rate as a crucial tool the central bank uses to influence economic factors. Given that monetary policy has a direct impact on economic growth and stability, central banks and commercial banks alike must comprehend how it is transmitted to make informed decisions. A study on the efficiency of monetary policy in South Africa was carried out by (Huh & Infante, 2021). They discovered that over over 20 months, positive monetary policy shocks could not hurt inflation, demonstrating the futility of monetary policy in reducing inflation. Additionally, they discovered that monetary policy had an impact on actual output, with a

positive shock to the economy eventually leading to a decline in industrial output. This demonstrates how difficult it is to implement monetary policy and the necessity of using several strategies, including having separate targets for employment and inflation, to properly manage the economy. The study finds that the application of inflation rate targeting in South Africa does not contribute to reducing inflation, and private sector credit demand is not affected by central bank policy.

(Agalega & Acheampong, 2013a) looked into the connections between real GDP in Ghana, policy rate, inflation, and government consumption. They discovered a long-term inverse link between real GDP and government consumption, suggesting that high levels of government expenditure could be detrimental to economic expansion. Additionally, they found a positive short-run correlation between real GDP, government consumption expenditure, and inflation, indicating that government spending can temporarily boost the economy. They did discover, however, a short-term negative correlation between real GDP and the policy rate, suggesting the possible influence of monetary policy on economic output. Notably, they discovered that, in their model, only the inflation rate significantly affected GDP, which could help to explain the government's inflation rate targeting policy.

These studies shed important light on the intricate relationship that exists between government spending, interest rates, inflation, real GDP, and monetary policy. The results emphasize how crucial it is to comprehend how monetary policy spreads and the possible effects of government expenditure on economic expansion. In the future, these lessons should be taken into account by policymakers as they develop and put into practice fiscal and monetary policies meant to foster sustainable growth and economic stability. To better understand these links and support evidence-based policy decisions, more study in this field is required.

2.6 Impact of Repo Rates on GDP Growth

Changes in the repo rate have a major effect on India's GDP growth, as empirical research has repeatedly shown According to research by (Bahlerao, 2017), variations in the repo rate cause equivalent 9 variations in the GDP growth rate. Lower borrowing costs for households and businesses result in higher investment and consumption spending, which boosts economic activity when the repo rate is lowered. On the other hand, when the repo rate rises, borrowing becomes more expensive, which discourages investment and consumption and negatively impacts the economy.

Furthermore, (Dawra, 2014) emphasized how lowering repo rates might extend loans in a lucrative way, thereby enhancing the potential of the banking sector. Repo rate decreases incentivize banks to lend more money to consumers and businesses by lowering the cost of borrowing, which stimulates economic growth.

2.7 Impact of Repo Rates on Inflation

An abundance of research has been done on the connection between India's inflation and repo rates. Higher inflation leads the RBI to raise the repo rate in an effort to halt price increases, A positive link between repo rates and inflation was shown (Das & Mitra, 2020)

suggesting a positive link between repo rates and inflation. An increase in inflation drives the RBI to raise the repo rate in an effort to slow the rise in prices. Repo rate reductions, on the other hand, can result from reduced inflationary pressures to boost economic growth.

(Joshi, 2012) discovered that repo rate movements have a major effect on inflation, with rate increases causing inflation to moderate and vice versa. These results highlight the repo rate's function as an instrument for India's inflation targeting. The RBI attempts to manage inflationary pressures and preserve price stability in the economy by modifying the repo rate.

2.8 Impact of Reverse Repo Rate on GDP Growth and Inflation

Despite being adjusted less frequently than the repo rate, the reverse repo rate nevertheless has a big economic impact. (Shaheen, 2020) looked at output growth and inflation control were affected by changes in the reverse repo rate. In the short run, a decline in the reverse repo rate encourages banks to lend more to consumers and businesses, which boosts output growth. On the other hand, a rise in the reverse repo rate lowers the amount of money available in the market, which helps to contain inflation. By lowering the amount of money available in the market, a rise in the reverse repo rate, on the other hand, helps limit inflation. When it comes to accomplishing macroeconomic goals, the reverse repo rate is a useful tool that complements the repo rate. The RBI can successfully control the economy's liquidity and inflationary pressures by changing both rates that is the repo rate and reverse repo rate.

To sum up, the development of India's inflation and economic growth is significantly influenced by repo and reverse repo rates. Adjustments to the repo rate have a major effect on GDP growth and inflationary pressures, as empirical studies have repeatedly shown. An all-encompassing approach to monetary policy is especially crucial given the reverse repo rate's complementary role in controlling inflation and liquidity. The implementation of suitable policy measures and comprehension of the transmission mechanism of repo rates and reverse repo rates can enable policymakers to adeptly traverse the intricate dynamics of the Indian economy, thereby attaining macroeconomic stability and growth. To fully understand the complexities of policy rate transmission processes and their wider consequences for economic development and stability, more research is necessary.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Problem of the Study

In the current setting, it is imperative to comprehend the interrelationships among the factors and their mutual influence. Directly establishing a cause-and-effect relationship between inflation, GDP growth, reverse repo rates, and repo rates can be challenging. This is so because there is a plethora of other variables that can affect economic statistics. For instance, in addition to changes in repo rates and reverse repo rates, market circumstances, trade with other countries, and government policies can all have an impact on GDP growth and inflation rates. The impact of fiscal policies: Taxation and spending are two examples of government policies that can significantly affect the economy. These policies have the potential to affect inflation and GDP growth. When examining the relationship between GDP, inflation, repo rates, and reverse repo rates, it is crucial to take these aspects into account.

3.2 Research Gap

Existing literature focused on all the monetary policy instruments and since monetary policy and its effects on the economy as a whole are the subject of a great deal of research, it is necessary to investigate the particular mix of macroeconomic variables, such as GDP growth and Inflation, that are impacted by changes in Repo rates and Reverse Repo rates. To fill this gap the present study aims to analyze the impact of these variables for 20 years period quarterly.

3.3 Data sources

The secondary data on quarterly historical Repo rates, Reverse Repo rates, Real GDP Growth, and Inflation will be obtained from the RBI, money control, RBI Occasional Papers,

RBI Bulletin, The Central Statistics website, DBIE-RBI: Database Indian Economy and Planning Commission and Organisation for Economic and Co-operation and Development website.

3.4 Data period

Quarterly data from January 2003 to September 2023 are being used to arrive at the desired outcome.

3.5 Sample variables

The independent variables in this topic are repo rates and reverse repo rates, as they are controlled and manipulated by the central bank. The dependent variables are GDP Growth and inflation, as they are influenced by the changes in repo rates and reverse repo rates.

3.6 Tools and Techniques

The study will employ time series data to examine the impact of changes in repo rates and reverse repo on GDP Growth and Inflation and also to analyze the causality of these variables the econometric tools and techniques are being used for data analysis:

a) Descriptive statistics

The preliminary quantitative analysis is performed using Descriptive statistics.

b) Unit root test

The stationarity of the data is examined using the unit root test.

c) Correlation

Correlation is used to measure the strength of the linear relationship between two variables and compute their association

d) Regression

Regression is used to analyze the relationship between variables by fitting a mathematical model.

e) Toda-Yamamoto Causality test

The existence of the causality and its direction is analyzed by employing the Toda-Yamamoto Causality test.

CHAPTER 4: DATA ANALYSIS AND CONCLUSIONS

4.1 DESCRIPTIVE STATISTICS

A dataset's primary characteristics can be summed up and described using descriptive statistics. The median is the value in a dataset that is in the middle when the values are ordered in either ascending or descending order, whereas the mean is the average of the dataset. The greatest value in the dataset is the maximum value, and the lowest value is the minimum value. The standard deviation calculates the data's variability and spread as well as the degree to which the results vary from the mean. The skewness quantifies how asymmetrical the data distribution is. It shows if the skewness of the data is symmetrical (zero skewness), skewed to the right (positive skewness), or slanted to the left (negative skewness). The data distribution's form is gauged by the kurtosis. Last but not least, the Jarque-Bera statistical test determines if the data has a normal distribution or not.

Table 4.1: DESCRIPTIVE STATISTICS

VARIABLES	MEAN	MEDIAN	MAXIMUM	MINIMUM	STD.DEV	SKEWNESS	KURTOSIS	JARQUE-BERA
Repo Rate	6.43	6.50	9.00	4.00	1.26	-0.36	2.39	3.02
Reverse Repo rate	5.27	5.67	7.50	3.25	1.27	-0.30	1.92	5.30
GDP Growth	1.75	1.79	22.56	-22.55	3.92	-1.14	28.55	2275.03
Inflation	6.61	6.19	15.32	1.46	2.75	0.82	3.49	10.12

Source: E-views computation and Author’s compilation

Interpretation

The descriptive statistics that are shown above reveal some key insights about the economic indicators in India. The average income or economic output is represented by the mean GDP Growth, which is 1.75. The average rate at which the prices of goods and services are rising is 6.61, which is the mean value of inflation. The average cost of borrowing for commercial banks is reflected in the mean repo rate, which stands at 6.43. Let's move on to monetary policy. As a final measure of the average return on loan to the central bank, the mean reverse repo rate is 5.27. The highest mean value is GDP Growth, while the lowest mean value is the reverse repo rate.

Interestingly GDP Growth has the largest standard deviation, at roughly 3.92. This indicates that the average variation in GDP Growth numbers for India is approximately 3.92 units from the mean. Repo rates and reverse repo rates, on the other hand, have the lowest standard deviations, both at about 1.2. This indicates that there may be a 1.2-unit variation between the average and the borrowing costs for banks and the returns on loans to the central bank. Therefore, whereas repo rates and reverse repo rates have smaller variability, GDP growth has the most variability.

The skewness of GDP Growth at -1.14, the Repo rate at -0.36, and the Reverse repo rate at -0.30 have negative skewness values indicating a concentration towards the higher end with some extremely low values. Inflation on the other hand has a positive skewness at 0.82.

The Jarque-Bera test statistics for GDP, Inflation, Repo Rate, and Reverse Repo Rate are 2275.03, 10.12, 3.02 and 5.30, respectively. These values indicate that the distributions of these variables deviate from a normal distribution. They do not exhibit a perfect normal distribution of the Repo rate and Reverse repo rate.

4.2 UNIT ROOT TEST

To investigate the characteristics of time series data, unit root tests are frequently employed in econometrics and time series analysis. They assist in identifying whether the data is non-stationary and shows a stochastic trend, which denotes that the data does not converge to a constant mean over time.

One particular type of unit root test that is frequently used in empirical research is the Augmented Dickey-Fuller (ADF) test and the present study also uses the ADF test. It solves some of the shortcomings of the Dickey-Fuller test and expands upon it. To account for potential autocorrelation and serial correlation in the data, the ADF test permits the inclusion of additional lagged differences in the regression equation.

Conducting the ADF test can also be useful in determining whether or not a time series has a unit root. The null hypothesis of the test is the assumption that a unit root exists, indicating non-stationarity". If the probability value is less than 0.05 at a specific significance level, or if the test statistic is greater than the critical value, we reject the null hypothesis and come to the stationary time series conclusion. It's crucial to remember that stationarity is preferred in time series analysis as it makes statistical inference more trustworthy and significant.

Table 4.2: UNIT ROOT TEST

PARTICULARS	T-STATISTICS	TEST CRITICAL VALUES			PROBABILITY	
		1%level	5%level	10%level	ADF AT LEVEL	ADF AT FIRST DIFFERENCE
Repo Rate	-2.76	-3.51	-2.90	-2.59	0.0694	0.0000
Reverse Repo Rate	-2.18	-3.51	-2.90	-2.59	0.2144	0.0001
GDP Growth	-9.06	-3.51	-2.90	-2.59	0.0000	0.0000

Inflation	-2.28	-3.51	-2.90	-2.59	0.1807	0.0002

Source: E-views computation and Author's compilation

INTERPRETATION

The variables under consideration exhibit unique patterns of integration and stationarity, as revealed by the outcomes of the Augmented Dickey-Fuller (ADF) test. In particular, it has been found that every variable shows some degree of integration or needs to initially differentiate at the First difference to become stationary.

Interestingly, the GDP Growth variable is stationary at the level, meaning that its intrinsic characteristics, such as mean and variance, don't change over time and don't require differencing.

4.3 CORRELATION

A statistical technique for determining the link between two or more variables is correlation analysis. It facilitates our comprehension of the relationship between changes in one variable and changes in another. The intensity and direction of the association between the variables are indicated by the correlation coefficient, which has a range of -1 to +1.

When two variables have a positive correlation, one of them tends to rise along with the other. When two variables have a negative correlation, one tends to increase while the other tends to decline. Although correlation analysis aids in understanding the link between variables, causality cannot be established without more research.

Table 4.3: CORRELATION

	GDP Growth	Inflation	Repo rate	Reverse Repo rate
Repo rate	0.17	-0.04	1	0.77
Reverse Repo rate	0.28	-0.09	0.77	1

GDP Growth	1	0.04	0.17	0.28
Inflation	0.04	1	-0.04	-0.09

Source: E-views computation and Author's compilation

INTERPRETATION

The GDP and the repo rate have a somewhat favorable association. This implies that there is a propensity for the GDP to rise together with an increase in the Repo rate. The GDP and the Reverse Repo rate also show a little positive association. This suggests that there is a small tendency for the GDP to increase along with an increase in the Reverse Repo rate. The Repo rate and Inflation have a very slender negative association. This indicates that there is a minor trend for inflation to decline when the repo rate climbs. The reverse repo rate and inflation have a marginally negative connection. This indicates that inflation tends to decline when the reverse repo rate rises.

4.4 REGRESSION

To investigate the relationship between variables, researchers employ regression analysis. Understanding the relationship between changes in one variable and changes in another is aided by this. The idea that the independent variable(s) and the dependent variable have a linear connection is tested using regression analysis. To do this, the Ordinary Least Squares (OLS) approach is used to estimate the coefficients of the regression equation.

The applications of regression analysis are numerous. The dependent variable's future values can be predicted using this method by using the values of the independent variable (or variables). Assessing the influence of independent factors on the dependent variable, determining important predictors, and understanding the direction and strength of the relationship between variables can all be aided by it. Regression analysis also enables us to test theories and draw conclusions about the population from sample data.

Table 4.4: REGRESSION

INDEPENDENT VARIABLE	DEPENDENT VARIABLE	COEFFICIENT	PROBABILITY
Repo rate	GDP Growth	1.5345	0.1204
	Inflation	-0.1102	0.7343
Reverse Repo rate	GDP Growth	3.0207	0.0121
	Inflation	-0.3240	0.4178

Source: E-views computation and Author's compilation

INTERPRETATION

The regression analysis shows us that GDP Growth and Repo rate according to the coefficient of 1.5345, there is a 1.5345 unit correlation between an increase in the repo rate of one unit and an increase in GDP growth of one unit. At the customary significance level (usually 0.05), the likelihood of 0.1204 suggests that this link is not statistically significant. The GDP Growth and Reverse Repo Rate According to the coefficient of 3.0207, there is a 3.0207 unit rise in GDP growth for every unit increase in the reverse repo rate. There is evidence to show that changes in the reverse repo rate have a considerable impact on GDP growth, as indicated by the statistical significance of the link, which is indicated by the probability of 0.0121. Repo rate and inflation The coefficient of -0.1102 indicates that there is a 0.1102 unit decrease in inflation for every unit increase in the repo rate. The likelihood of 0.7343, however, suggests that there is little statistical significance in this link. Reverse Repo Rate and Inflation The coefficient of -0.3240 shows that a 1 unit increase in the reverse repo rate is connected with a -0.3240 unit drop in inflation. According to the likelihood of 0.4178, there is no statistical significance in this link either.

4.5 TODA-YAMAMOTO CAUSALITY TEST

Based on the estimation of the enhanced VAR model (k+dmax), Toda and Yamamoto (1995) presented a version of the Granger causality test. In this case, the greatest integrated order is denoted by dmax, and the optimal lag on the first VAR model is represented by k in relation to the VAR model.

A statistical technique called the Toda-Yamamoto test is used to determine if variables in a time series setting are causally related. Its purpose is to examine non-stationary time series data for Granger causation.

When there may be a possible causal association between variables but they are non-stationary that is, their variance and mean fluctuate over time, the Toda-Yamamoto test is more useful.

Thus, the direction and existence of causality between the variables under investigation are being examined using the TYDL test. Finding the presence or absence of causation was the goal of the study. Additionally, in the cases where causation was present, the objective was to determine if the causality was unidirectional or bidirectional.

Table 4.5: TODA-YAMAMOTO CAUSALITY TEST

Null Hypothesis	Chi-Square	Probability	Granger Causality
Repo rates does not granger cause GDP Growth	0.9651	0.8097	There is no Causality
GDP Growth does not granger cause Repo rates	1.1879	0.7559	
Repo rate does not granger cause Inflation	15.0869	0.0269	Unidirectional causality
Inflation does not granger cause the Repo rate	4.3605	0.7374	Repo rate → Inflation
Reverse repo rate does not granger cause GDP Growth	1.9728	0.5781	There is no Causality
GDP Growth does not granger cause Reverse Repo rate	0.6808	0.8777	

Reverse Repo rate does not granger cause Inflation	0.7326	0.6933	There is no Causality
Inflation does not granger cause a Reverse Repo rate	0.5013	0.7783	

Source: E-views computation and Author's compilation

INTERPRETATION

There is no evidence of Granger causation between Repo rates and GDP Growth, according to the chi-square value of 0.9651 with a probability of 0.8097. In other words, fluctuations in GDP Growth are not caused by changes in repo rates.

The correlation between Inflation and Repo rates is shown to be unidirectional, as indicated by the chi-square value of 15.0869 and probability of 0.0269. Changes in Repo rates are causally related to changes in Inflation, as stated by Granger.

Reverse Repo rates and GDP Growth, the granger causation between reverse Repo rates and GDP Growth is not supported by the chi-square value of 1.9728, which indicates a probability of 0.5781. Changes in GDP Growth are not caused by reverse repo rates.

Granger causality between Reverse Repo rates and Inflation is not supported by the chi-square value of 0.7326, which has a probability of 0.6933. The Inflation rate is not affected by Reverse Repo rates.

4.6 Major Findings

This study is an attempt to capture the impact of repo rate and reverse repo rate and its fascinating relationship with GDP Growth and Inflation. This subject is crucial to economics because it reveals the significant effects that monetary policy has on the overall state of the economy. This work attempts to disentangle the links and provide insightful information about the underlying dynamics through rigorous analysis and solid empirical evidence.

The study found some interesting findings. Firstly, it was found that repo rate and reverse repo rate had a positive association with GDP Growth and Inflation which suggested that there is a small tendency for the GDP to increase along with an increase in the reverse repo rate. The repo rate and reverse repo rate had a negative association with GDP Growth and Inflation which indicated that the dependent variables tend to decline when the repo rate and reverse repo rate rise. Secondly, it was found that changes in Reverse Repo rates by RBI have a considerable impact on GDP Growth in India.

To check for causality and the directions of the variables the Toda-Yamamoto test was employed. The findings of the test revealed that Inflation and Repo rates are shown to have a unidirectional direction which meant that changes in Repo rates are causally related to changes in Inflation.

4.7 Conclusions of the Study

The findings suggest that GDP growth tends to slow down and inflation tends to rise when both the repo rate and the reverse repo rate rise. On the other side, GDP growth tends to rise and inflation tends to fall when the repo rate and reverse repo rate fall. It resembles a careful balancing act with these factors.

The second finding states that reverse repo rate fluctuations have a major effect on India's GDP growth and are extremely important. It emphasizes how crucial the RBI's activities are in shaping the nation's overall economic growth. The economy can be significantly impacted by changes in reverse repo rates, which can also have a significant impact on other industries and sectors.

An effective method for examining causality and varied directions is the Toda-Yamamoto test. The findings of this test that there exists a causal relationship between variations in repo rates and variations in inflation suggests that the repo rate exerts a significant impact on

inflation levels. It resembles a cause-and-effect connection in which variations in repo rates are accompanied by variations in inflation.

These results lead us to the conclusion that the monetary policy of India especially, the repo rate and reverse repo rate have a big influence on inflation and GDP growth. The RBI's decisions to change these rates have the power to influence India's economic landscape. To support economic stability and growth, policymakers, economists, and businesses can all benefit from having this understanding.

4.8 Suggestions

Given the positive associations between repo rates and GDP Growth, the policymakers of India could consider monitoring and adjusting the repo rates in such a way that it stimulates economic growth in the country when needed.

Since repo rate and reverse repo rates have a positive association with inflation in India policymakers could focus on finding a balance between controlling inflation and promoting economic growth by carefully adjusting these rates

4.9 Scope for further studies

1. This study has focused on only two monetary policy instruments i.e. Repo rate and Reverse repo rate so further analysis can be done by considering all the monetary policy instruments.
2. This study has focused on only 2 macroeconomic variables i.e. GDP and Inflation so further studies can be done by taking other macroeconomic variables.
3. A similar study on how changes in repo rate and reverse repo rate affect the stock market can be also done.

4.10 Limitation of the Study

1. The study is restricted to only two monetary policy instruments i.e Repo rate and Reverse Repo rate

2. The study is restricted to only two macroeconomic variables i.e GDP and Inflation.

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