**EXAMINING THE CAUSAL RELATIONSHIPS IN INDIA'S INTEREST RATE STRUCTURE**

**Abstract**

**Purpose:** The study aimed to explore the causal relationships among the call money rate, the term deposit rate above five years, and the lending rate during the period from 1980 to 2020.

**Methodology:** The empirical analysis employed the Augmented Dickey-Fuller (ADF) test to check stationarity, the Johansen cointegration test to identify long-term relationships, and the Granger causality test to investigate causal connections among the variables.

**Findings:** The ADF test results indicated that all variables were integrated at order one. The Johansen cointegration test revealed the existence of long-term relationships among the variables. The Granger causality test demonstrated no causal link between the term deposit rate above five years and the call money rate. However, it identified bidirectional causality between the lending rate and the call money rate, as well as between the lending rate and the term deposit rate above five years.

**Originality:** This study provided an in-depth analysis of the interrelations among key interest rates in India over four decades, providing insights into their dynamics and implications for monetary policy.

**Keywords:** Term Deposit Rates; Call Money Rate; Lending Rate.

**1. Introduction**

One of the macroeconomic indicators that have received more attention in the era of globalization is the interest rate ([Bhattacharya et al., 2008](#Bhattacharya2008); [Simiyu and Ngile, 2015](#Simiyu2015)). This rising interest arises from the growing inclusion of the national financial system into the global financial sector. The removal of constraints on the global movement of capital has a substantial impact on domestic factors, particularly interest rates. Consequently, a new approach to influencing economic development goals has emerged, referred to as the interest rate channel, which facilitates the transmission of policy shocks. Over recent years, this channel has gained significance and resilience, especially in most emerging economies, contingent upon the extent of capital account openness. Moreover, this phenomenon has rendered domestic financial markets more vulnerable to global shocks and cycles, diminishing the traditional impact of terms of trade shocks prevalent in closed economies.Top of Form Hence, any adjustments to the interest rate or monetary policy in the main global economy will have a delayed effect on the financial markets of emerging economies. The connections between interest rates and other macroeconomic factors have been a subject of continuous study and discussion among economists, encompassing both theoretical discussions and practical implications ([Edwards and Khan, 1985](#Edwards1985)). The implementation of a high-interest-rate policy is deemed essential for various causes. It is considered a method to alleviate many negative economic consequences, such as preventing the decrease in exchange rates and reducing inflationary pressures. The Reserve Bank of India has adopted a policy of keeping interest rates at a high level to minimize the negative impacts of excessive fluctuations in currency markets, particularly in the foreign exchange market. Many countries' monetary authorities tend to pursue a high-interest-rate strategy when their currency is under pressure, while opting for low-interest-rate approaches when the currency is stable ([Bhunia, 2013](#Bhunia2013)). In India, the interest rate structure comprises multiple categories, including deposit rates determined by varying periods. The rates provided are for deposits with durations of 1 to 3 years (DR1), deposits exceeding 3 years up to 5 years (DR2), and deposits above 5 years (DR3). In addition, there are call money rates, Weighted Average Lending Rate (WALR) for Fresh Rupee Loans, lending rates, and the Marginal Cost of Funds based Lending Rate (MCLR). Due to the lack of data during the study periods, this research focuses solely on investigating the causal relationship between term deposit rate above 5 years, lending rate, and call money rate.Top of Form

**2. Review of Literature**

[Top of Form](#Rasool2023)

[Rasool (2023)](#Rasool2023)examined the inflation dynamics in India using ARDL and Granger causality tests. The ARDL findings indicated that interest rate shocks and output growth have a reducing impact on inflation, whereas rupee depreciation and an expansion in money supply exert inflationary pressures on the economy. In addition, the Granger causality study revealed that money supply and interest rates possessed a causal impact on output and inflation. [Qasim et al. (2023)](#Qasim2023) examined the Classical approach to interest rate determination in India using dynamic ordinary least squares methods. Their findings revealed a positive association between DR1 and DR2 with GDS, aligning with classical ideas. Conversely, DR3 exhibited a negative association with GDS. Furthermore, the econometric analysis results for GDI and LR supported the assumptions advocated by classical economists. [Maitra (2022)](#Maitra2022)explored the influences of monetary, fiscal and trade openness on the volatility of nominal and real interest rate in India. His findings indicated that the fiscal deficit had a short-term negative effect on the deposit rate while positively influencing the real interest rate.Top of Form[Pakira (2015)](#pakira2015) observed only bidirectional causal connection between Average Lending Rates and Savings Rates in India.**Top of Form** [Ray (2012)](#Ray2012)conducted an analysis of the correlation between various macroeconomic indices and Indian stock prices. His study revealed no statistically significant correlation between stock market valuation and interest rates.On the other hand,[Nishat et al. (2004)](#Nishat2004)concluded thatthere was a strong positive correlation between industrial production and stock prices. [Dua and Pandit (2002)](#Dua2002)observed that foreign interest rates significantly influence the determination of interest rate in India. [Bhanumurthy and Agarwal (2003)](#Bhanumurthy2003) argued that in India, interest rates respond to expected changes in retail market pricing rather than wholesale market prices. [Kim (2003)](#Kim2003) observed a direct association between stock prices and industrial production, as well as an inverse correlation between stock prices and the real exchange rate, interest rate, and inflation in the US. [Gould et al. (2001)](#Gould2000) conducted a study examining the effects of interest rate, risk premiums, and exchange rate on six countries. Their research found that the primary determinants impacting the exchange rate in these nations were credit spreads and stock prices. [Muradoglu et al. (2000)](#Muradoglu2000) concluded that the size of the stock market is the key factor influencing the correlation between stock returns and macroeconomic conditions. [Keminsky et al. (1998)](#Keminsky1998)determined that the interest rate should not be regarded as an exogenous variable. [Goldfajn et al. (1998)](#Goldfajn1998) explored the link between real interest rates and real exchange rates through Vector Auto-regression and impulse response function. However, the study did not conclusive results regarding the robustness of the relationship between interest rates and currency rates. [Kraay (1998)](#Kraay1998) found that high-interest rate policies were ineffective in effectively safeguarding currencies against speculation.

After a thorough examination of the available literature, it is clear that there is a scarcity of empirical research that investigates the structure of interest rates in India. This research tries to address the gap by doing a time series analysis of the structure of interest rates in the Indian money market using the Granger Causality test.Top of Form

**3. Research Methodology**

The objective of this study is to examine the causal relationship between the Call Money Rate (CMR), Term Deposit Rate above five years (DR5), and Lending Rate (LR) from 1980 to 2020. The data for all the chosen variables has been taken from the handbook of statistics on the Indian economy published by the RBI. The unit roots test is performed using the Augmented Dickey-Fuller (ADF) approach ([Dickey and Fuller, 1979](#Dickey1979)) with the use of following expression.

$$ ∆ Y\_{t}=α+βY\_{t-1}+\sum\_{i=1}^{k}∅\_{i}∆Y\_{t-1}+ε\_{t} 1$$

Based on the ADF results, the study moved to the next stage, which involved investigating the lag length structure to determine the optimum lag length through VAR lag order selection criteria. To identify a long-run relationship among CMR, TDR-5, and LR, the Johansson cointegration test is used; on the other hand the Granger causality test is performed to identify the causal relationship among CMR, TDR-5, and LR.

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**4. Results and Analysis**

**Table 1**

**Summary Statistics for Equation 1**

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Levels** | **First Differences** |  |
|  | **t-Statistics** | **Prob.** | **t-Statistics** | **Prob.** | **Order of Integration** |
| **CMR** | -2.763421 | 0.0727 | -6.996919 | **0.0000** | **I(1)** |
| **DR(5)** | -2.191038 | 0.2126 | -4.669142 | **0.0005** | **I(1)** |
| **LR** | -0.902292 | 0.7773 | -6.190491 | **0.0000** | **I(1)** |

Source: Author`s Calculations

Table 1 presents the statistical information derived from equation 1, indicating that the series in the models are non-stationary at the level. However, they become stationary after first differences, signifying integration of order one at the 5% significance level.

**Table 2**

**VAR Lag Order Selection**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Lag** | **LogL** | **LR** | **FPEC** | **AIC** | **SIC** | **HIC** |
| 0 | -252.1424 | NA | 96.60490 | 13.08423 | 13.21219 | 13.13014 |
| 1 | -189.0363 | 113.2674 | 6.038130 | 10.30955 | 10.82142 | 10.49321 |
| **2** | **-168.1906** | **34.20832\*** | **3.320930\*** | **9.702083\*** | **10.59785\*** | **10.02347\*** |

\*Indicates lag order selected by the criterion

 Source: Author`s Calculations.

In order to identify the appropriate lag length, this study used VAR-based lag order selection, employing five information criteria: AIC, SIC, HIC, and FPEC. Based on the analysis of all five criteria, it is consistently determined that the most suitable lag length is 2, as presented in Table 2. Therefore, further econometrics analyses will use a lag 2.

**Table 3**

**Johansen Cointegration Results**

|  |  |  |
| --- | --- | --- |
| **Hypothesized** | **Trace** | **Maximum Eigenvalue** |
| **No. of CE(s)** | **Trace****Statistic** | **0.05 critical****value** | **Prob.** | **Max-Eigen Statistic** | **0.05 critical****value** | **Prob.** |
| **None\*** | 32.64729 | 29.79707 | **0.0229** | 22.95626 | 21.13162 | **0.0274** |
| At most 1 | 9.691029 | 15.49471 | 0.3053 | 9.050096 | 14.26460 | 0.2820 |
| At most 2 | 6.640933 | 3.841455 | 0.4234 | 0.640933 | 3.841465 | 0.4234 |

 Source: Author`s Calculations

Table 3 displays the Trace and Max-Eigen parameters associated with the Johansen cointegration test. The p-values for both Trace and Max-Eigen are below 0.05. These results indicate that there is only one cointegration. Therefore, we conclude that the variables are cointegrated, suggesting a long-run relationship among them.

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**Table 4**

**Granger Causality Test**

|  |  |  |  |
| --- | --- | --- | --- |
| **Null Hypothesis** | **F-statistics** | **Probability** | **Decision** |
| TDR-5 does not Granger cause CMR | 1.33560 | 0.2764 | No causality |
| CMR does not Granger Cause TDR-5 | 0.03349 | 0.9671 | No causality |
| LR does not Granger Cause CMR | 4.99434 | **0.0125** | **Causality** |
| CMR does not Granger Cause LR | 18.1888 | **0.0000** | **Causality** |
| LR does not Granger Cause TDR-5 | 9.42832 | **0.0006** | **Causality** |
| TDR-5 does not Granger Cause LR | 8.23303 | **0.0012** | **Causality** |

Source: Author`s Calculations

The study used a pairwise Granger causality test to look for possible connections between the lending rate, the term deposit rate above five years, and the call money rate. Table 3 displays the outcomes of the pairwise Granger causality test, revealing that there are no causal connections between the term deposit rate above five years and the call money rate However, there is bidirectional causality between lending rate and call money rate, as well as lending rate and term deposit rate above five years.

**5. Conclusion**

The study explored the correlation between the call money rates (CMR), term deposit rate (TDR5), and lending rate (LR). Results from the Augmented Dickey-Fuller Test indicate that all variables exhibit stationarity at their first differences. Moreover the Johansen approach confirms the presence of long-run relationships among the variables whereas, the Granger Causality Test reveals that only bidirectional causal connection between lending rate and call money rate, as well as lending rate and term deposit rate above five years during the study period.

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**References:**

1. Bhanumurthy NR, Agarwal S. Interest rate-price nexus in India. Indian Economic Review. 2003 Jul 1:189-203.
2. Bhattacharya BB, Bhanumurthy NR, Mallick H. Modeling interest rate cycles in India. Journal of Policy Modeling. 2008 Sep 1; 30 (5):899-915.
3. Bhunia A. Cointegration and causal relationship among crude price, domestic gold price and financial variables: an evidence of BSE and NSE. Journal of contemporary issues in business research. 2013; 2(1):1-0.
4. Dickey DA, Fuller WA. Distribution of the estimators for autoregressive time series with a unit root. Journal of the American statistical association. 1979 Jun 1:427-31.
5. Dua P, Pandit BL. Interest rate determination in India: domestic and external factors. Journal of Policy Modeling. 2002 Dec 1; 24 (9):853-75.
6. Edwards S, Khan MS. Interest rate determination in developing countries: A conceptual framework. National Bureau of Economic Research; 1985 Jan 1.
7. Baig T, Goldfajn I. Monetary policy in the aftermath of currency crises: The case of Asia. Review of International Economics. 2002 Feb; 10 (1):92-112.
8. Gould DM, Kamin SB. The impact of monetary policy on exchange rates during financial crises. Financial crises in emerging markets. 2001 Apr 23; 384:420.
9. Kaminsky G, Schmukler S. 1The Relationship between Interest Rates and Exchange Rates in Six Asian Countries, 1998.
10. Kim KH. Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. Review of Financial economics. 2003 Jan 1; 12 (3):301-13.
11. Kraay A. Do high interest rates defend currencies during speculative attacks? Journal of International Economics. 2003 Mar 1; 59 (2):297-321.
12. Maitra B. How do fiscal, monetary policies and trade openness impact interest rates in India? Journal of Public Affairs. 2022 Nov; 22 (4):e2674.

1. Muradoglu G, Taskin F, Bigan I. Causality between stock returns and macroeconomic variables in emerging markets. Russian & East European Finance and Trade. 2000 Nov 1; 36(6):33-53.
2. Nishat M, Shaheen R, Hijazi ST. Macroeconomic factors and the Pakistani equity market. The Pakistan Development Review. 2004 Dec 1:619-37.
3. Pakira SK. Investigating the relationship between call money rates and term deposit interest rates structure in India. ZENITH International Journal of Multidisciplinary Research. 2015; 5(12):59-67.
4. Qasim R, Ahmad J, Alam D. Dynamics of Savings and Investment and Determination of Rate of Interest in Indian Money Market: A Classical Approach. Dynamics. 2023 Sep; 13(3).
5. Rasool H. Identifying Inflation Dynamics in India in the Post Reform Period. South Asian Journal of Macroeconomics and Public Finance. 2023 Jun; 12(1):53-82.
6. Ray S. Testing granger causal relationship between macroeconomic variables and stock price behaviour: evidence from India. Advances in Applied Economics and Finance. 2012; 3(1):470-81.
7. Simiyu, Christine Nanjala, and Lessah Nzioka Ngile. "Effect of macroeconomic variables on profitability of commercial banks listed in the Nairobi securities exchange." 2015.