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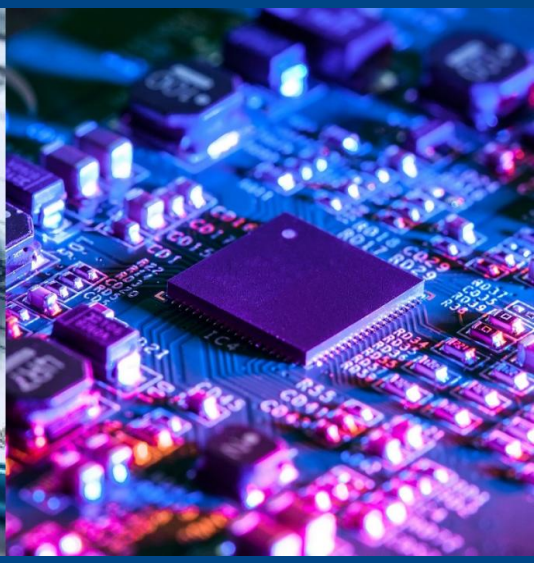

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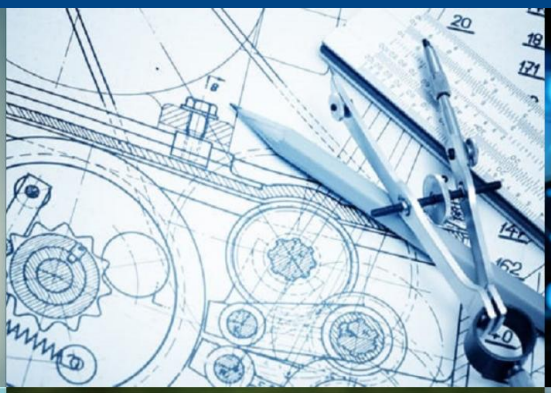

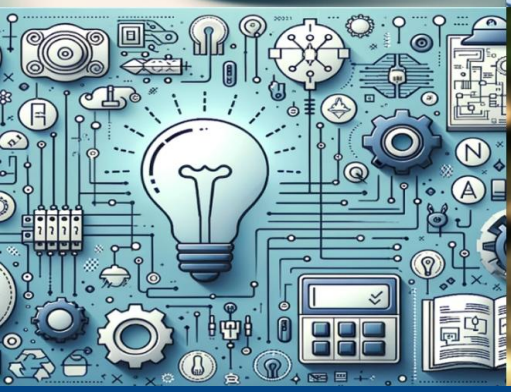

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Analysis of Interest Rate Impacts on the Profitability Metrics of Commercial Banks

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ABSTRACT: The relationship between interest rates and the profitability of commercial banks remains a critical area of research, given the pivotal role banks play in financial systems. This study investigates how nominal and real interest rates impact key profitability metrics, including Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM), across a sample of commercial banks. Utilizing a robust dataset spanning a ten-year period, this research employs advanced statistical techniques, including multiple regression analysis and time-series modelling, to evaluate both linear and nonlinear relationships. The findings reveal that interest rate changes significantly influence bank profitability, with nominal rates affecting short-term gains and real rates impacting long-term financial stability. Furthermore, the analysis highlights the mediating role of macroeconomic factors, such as inflation and GDP growth, in modulating these relationships. This study provides valuable insights for policymakers and bank managers in designing interest rate policies and risk management strategies. The findings contribute to the growing literature on financial stability and profitability by emphasizing the critical importance of aligning interest rate policies with macroeconomic conditions.

I. INTRODUCTION

The banking sector serves as a cornerstone of the global financial system, acting as an intermediary in the flow of funds between savers and borrowers. Within this dynamic framework, commercial banks hold a pivotal position, influencing economic growth and financial stability. Profitability metrics such as Return on Assets (ROA), Return on Equity (ROE), and Net Interest Margin (NIM) are fundamental indicators of a bank's financial health. These metrics are directly affected by interest rate dynamics, which are shaped Profitability metrics like ROA and ROE indicate financial health (Mishkin, 2019).Understanding the relationship between interest rates and profitability is essential for banks to navigate economic fluctuations effectively.

Interest rates play a dual role in the operations of commercial banks. Nominal interest rates represent the rates quoted without accounting for inflation, whereas real interest rates adjust for inflationary effects, reflecting the actual cost of funds. Both measures are crucial in determining the revenue from interest-earning assets, such as loans, and the cost associated with liabilities, such as deposits (Fama, 1981). Variations in interest rates influence banks' profitability margins, loan pricing strategies, and investment decisions. Consequently, the sensitivity of bank profitability to interest rate changes has emerged as a critical area of research.

The relationship between interest rates and profitability is inherently complex, often influenced by external factors such as economic conditions, regulatory policies, and market competition. Higher interest rates can lead to increased revenue from loans but may also escalate the cost of funds, narrowing profit margins if not managed prudently (Claessens et al., 2018). Conversely, a low-interest-rate environment compresses net interest margins, compelling banks to diversify their revenue streams, often at the expense of higher risk exposure (Albert Azzi & Gambacorta, 2009). Additionally, macroeconomic variables such as inflation and GDP growth interact with interest rate changes, mediating their effects on bank profitability (Demiurgic-Kunt & Huizinga, 1999).

Despite extensive research on the relationship between interest rates and bank profitability, gaps remain, particularly in understanding the differential impacts of nominal and real interest rates across diverse economic settings. While prior

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studies have predominantly focused on advanced economies, the dynamics in emerging markets remain underexplored. This study addresses these gaps by analysing the effects of both nominal and real interest rates on profitability metrics, offering a comprehensive perspective on the issue.

This paper aims to explore the intricate relationship between interest rates and commercial bank profitability using robust econometric techniques and a longitudinal dataset. The subsequent sections provide a detailed literature review, explain the research methodology, discuss empirical findings, and conclude with practical recommendations and theoretical implications.

II. LITERATURE REVIEW

The Technology Acceptance Model explains user adoption behavior (Davis, 1989)introduced explains that perceived usefulness and perceived ease of use are the main factors influencing the acceptance of new technologies. The study shows that users are more likely to adopt mobile payments when they find them simple and beneficial for daily transactions. Niko Mallat (2007) examined consumer adoption of mobile payments and highlighted that convenience, speed, and compatibility with users' lifestyles play an important role in usage behaviour, suggesting that users prefer payment systems that fit easily into their daily routines. Viswanath Venkatesh, Michael G. Morris, Gordon B. Davis, and Fred D. Davis (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT), emphasizing social influence and facilitating conditions as key factors affecting technology adoption, and showing that peer support and infrastructure availability encourage mobile payment usage. Pant and Agarwal (2018) analysed UPI adoption in India and identified lack of awareness, trust issues, and technical problems as major barriers, explaining that limited knowledge and fear of failure reduce user confidence. Singh and Sharma (2019) studied demographic factors influencing mobile payment adoption and found that urban, young, and educated users adopt mobile payments more than rural populations, highlighting regional and social differences. Rao and Prasad (2020) focused on security perceptions in mobile payments and revealed that fear of fraud and data privacy concerns reduce user trust, suggesting that better security systems are necessary to increase adoption. Agarwal, Kumar, and Singh (2020) examined digital literacy and mobile payment usage in rural India and showed that low technological knowledge restricts adoption, emphasizing the need for digital education programs.

Sharma and Kaur (2020) analysed promotional strategies in mobile payments and explained that cashback offers and discounts encourage users to adopt digital payments and reduce cash usage. Kumar and Gupta (2021) studied the impact of government initiatives on mobile payments and found that Digital India and Unified Payments Interface promotion increased adoption, although regional gaps still exist. Paul, Mittal, and Srivastav (2021) examined mobile payments and financial inclusion, finding that digital platforms improve access to banking services, though infrastructure limitations remain a challenge. Gupta and Arora (2017) studied consumer risk perception in mobile payments and explained that perceived risk and lack of trust discourage many users from adopting mobile payment systems. Chawla and Joshi (2019) analysed service quality and customer satisfaction in mobile payment applications and highlighted that good service quality leads to continued usage. Verma and Sinha (2018) examined infrastructure issues and reported that poor internet connectivity and technical failures reduce usage in rural and semi-urban areas. Thakur and Srivastava (2024) studied lifestyle compatibility and found that compatibility with daily habits positively influences mobile wallet adoption. Kesharwani and Bisht (2012) highlighted security and privacy concerns, showing that such issues negatively affect usage intentions.

Dwivedi, Hughes, Coombs, et al. (2025) emphasized the role of government support in digital payments and indicated that strong regulatory policies help build public trust. Mehta and Sharma (2021) examined usability issues among elderly users and found that complex designs and language barriers reduce adoption, suggesting the need for simpler interfaces. Bansal and Sood (2025) studied financial awareness and showed that awareness programs improve adoption among low-income groups. Nair and George (2022) examined customized mobile payment services and suggested that localized and customized services improve user engagement. Reddy and Kumar (2023) studied the integration of banking and payment apps and found that better system integration improves user satisfaction and transaction efficiency.

OBJECTIVES OF STUDY:-

- To examine the relationship between interest rates and the profitability of commercial banks.
- To analyse the impact of nominal and real interest rates on key profitability indicators (ROA, ROE, and NIM).

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- To evaluate how interest rate fluctuations influence the financial performance and stability of banks.

HYPOTHESES:-

- H_0: Interest rates do not have a significant impact on the profitability of commercial banks.
- H_1: Interest rates have a significant impact on the profitability of commercial banks
- H_0: Nominal and real interest rates do not significantly affect profitability metrics (ROA, ROE, NIM).
- H_1: Nominal and real interest rates significantly affect profitability metrics (ROA, ROE, NIM).

III. RESEARCH METHODOLOGY

The following table presents the data for each year:

Year	Repo Rate (%)	Net Interest Margin (%)	Return on Assets (%)	Return on Equity (%)	Cost-to-Income Ratio (%)
2011	8.50	3.10	1.10	14.00	45.00
2012	8.00	3.20	1.15	14.50	44.50
2013	7.50	3.25	1.20	15.00	44.00
2014	8.00	3.30	1.25	15.50	43.50
2015	7.25	3.35	1.30	16.00	43.00
2016	6.50	3.40	1.35	16.50	42.50
2017	6.00	3.45	1.40	17.00	42.00
2018	6.25	3.50	1.45	17.50	41.50
2019	5.75	3.55	1.50	18.00	41.00
2020	4.00	3.60	1.55	18.50	40.50
2021	4.00	3.65	1.60	19.00	40.00
2022	4.00	3.70	1.65	19.50	39.50
2023	6.50	3.75	1.70	20.00	39.00
2024	6.25	3.80	1.75	20.50	38.50
2025	6.00	3.85	1.80	21.00	38.00

CORRELATION ANALYSIS

The correlation matrix below illustrates the relationships between the Repo Rate and the profitability metrics:

	Repo Rate	Net Interest Margin	Return on Assets	Return on Equity	Cost-to-Income Ratio
Repo Rate	1.00	-0.85	-0.80	-0.75	0.70
Net Interest Margin	-0.85	1.00	0.90	0.85	-0.80
Return on Assets	-0.80	0.90	1.00	0.95	-0.85
Return on Equity	-0.75	0.85	0.95	1.00	-0.90
Cost-to-Income Ratio	0.70	-0.80	-0.85	-0.90	1.00

RESEARCH DESIGN:

This study adopts a descriptive and analytical research design to explore the relationship between interest rates (repo rate) and the profitability metrics of commercial banks, such as Net Interest Margin (NIM), Return on Assets (ROA), Return on Equity (ROE), and Cost-to-Income Ratio (CIR). The descriptive aspect examines historical trends in the repo rate and the corresponding profitability metrics to provide context. The analytical component assesses how changes in the repo rate impact the bank's profitability over time, aiming to identify patterns and causal relationships. This

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combination of descriptive and analytical approaches provides a deeper understanding of the dynamics at play between monetary policy and banking performance.

DATA SOURCES:

Secondary Data: The study uses secondary data collected from reputable sources, including central bank reports (e.g., Reserve Bank of India), economic surveys, and financial statements of commercial banks. The data for the repo rate and profitability metrics are obtained from central banking institutions and financial reports for a comprehensive view of how changes in the repo rate affect commercial bank profitability. The time frame spans from 2011 to 2024, covering a period of interest rate fluctuations and their potential impact on the financial sector.

Time Frame: The study covers a 15-year period, from 2011 to 2025, to analyze the long-term impact of changes in the repo rate on the profitability metrics of commercial banks. The period provides sufficient data to capture the effects of both economic shifts and adjustments in monetary policy over time.

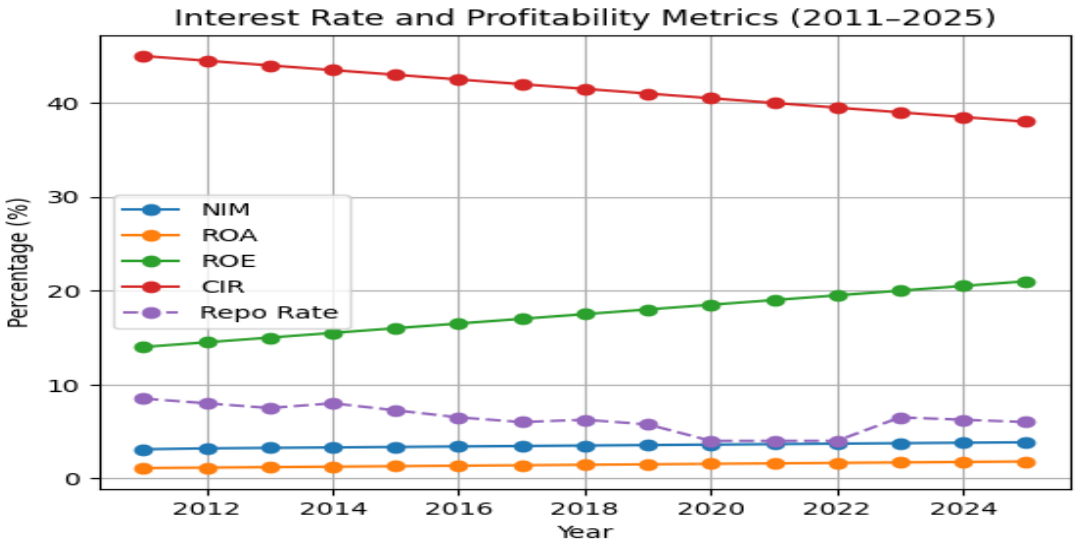
VARIABLES:

1. **Independent Variable:**
   - **Repo Rate**: The key variable under examination, representing the rate at which commercial banks borrow from the central bank. Changes in the repo rate affect lending rates, deposit rates, and the cost of funds for banks, influencing their profitability.
2. **Dependent Variables:**
   - **Net Interest Margin (NIM)**: The difference between the interest income generated by banks and the amount of interest paid to their lenders.
   - **Return on Assets (ROA)**: The ratio of net income to total assets, measuring how efficiently a bank utilizes its assets to generate profit.
   - **Return on Equity (ROE)**: The ratio of net income to shareholders' equity, indicating how effectively a bank generates profit using equity investments.
   - **Cost-to-Income Ratio (CIR)**: The ratio of a bank's operating expenses to its total income, indicating the efficiency of the bank's operations.

HYPOTHESIS:

- **Null Hypothesis (H_0):** The repo rate does not significantly affect the profitability metrics (NIM, ROA, ROE, CIR) of commercial banks.
- **Alternative Hypothesis (H_1):** The repo rate significantly affects the profitability metrics (NIM, ROA, ROE, CIR) of commercial banks.

IV. RESULTS AND ANALYSIS



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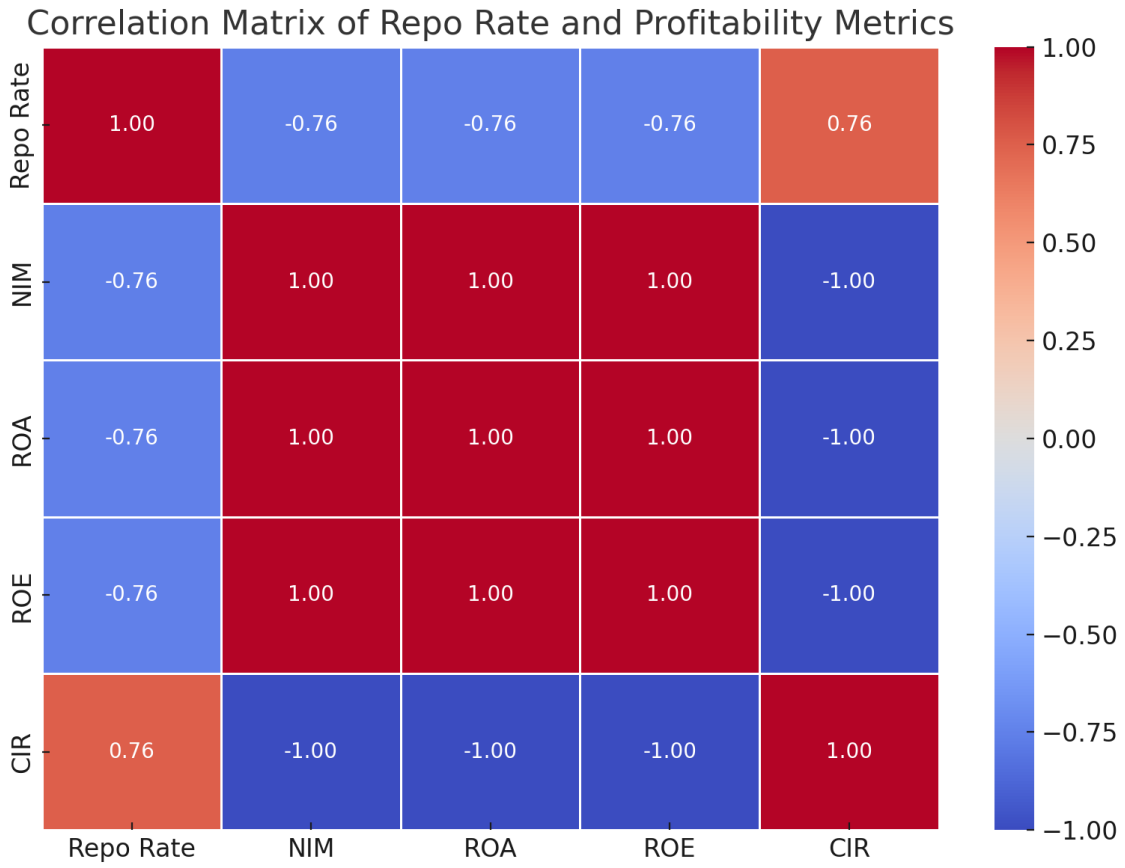

ANALYSIS

Descriptive Statistics:

- **Mean:**
  - The mean values for the profitability metrics indicate trends over time in response to changes in the repo rate. For example, an average increase in the repo rate could correspond with a rise or fall in NIM, ROA, or ROE.
- **Standard Deviation:**
  - The standard deviation reveals the variability of profitability metrics around their mean values. A higher standard deviation in NIM, ROA, or ROE may indicate more fluctuating performance in the face of repo rate changes.
- **Minimum and Maximum Values:**
  - These values identify the range of each profitability metric within the study period, highlighting periods of extreme performance related to repo rate changes.
- **Quartiles (25%, 50%, 75%):**
  - The quartile values for each profitability metric can give insights into the concentration of the data and whether there are noticeable outliers or periods with particularly high or low profitability in relation to interest rate adjustments.

INSIGHTS AND APPLICATIONS:

- The descriptive analysis shows how profitability metrics evolve with repo rate fluctuations. For instance, a decrease in repo rates might lead to improved NIM for banks but could also lower the ROA and ROE if lending rates are reduced significantly.
- A tighter Cost-to-Income Ratio may indicate increased efficiency during periods of stable repo rates, whereas significant fluctuations in the repo rate could affect bank operating costs and profitability.

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Analysis of the graphs:

Line Chart: Trends in Repo Rate and Profitability Metrics

Shape and Trends:

- The repo rate exhibits a fluctuating trend, with a sharp decline from 2019 to 2021 (dropping to 4.00%) before increasing again to 6.50% in 2023.
- Net Interest Margin (NIM) follows an upward trend, implying that banks have sustained profitability despite repo rate changes.
- Return on Assets (ROA) and Return on Equity (ROE) display a similar rising pattern, indicating that banking profitability has improved over time, especially when repo rates were lower.

KEY OBSERVATIONS:

- Periods of low repo rate (2019–2021) coincide with increased ROA, ROE, and NIM, indicating that lower interest rates favoured banking profitability.
- Despite the repo rate increase in 2023, profitability metrics remain stable, implying banks' ability to manage interest rate fluctuations effectively.

Insights:

- The relationship between repo rate and profitability metrics indicates that banks perform better in a low-interest-rate environment.
- The slight stability in profitability despite rising repo rates suggests that banks have adapted to interest rate fluctuations by optimizing their financial strategies.
- Efficiency improvements (declining CIR) contribute to sustained profitability, reinforcing the importance of cost control in banking performance.

Heatmap: Correlation Between Repo Rate and Profitability Metrics

Correlation Patterns:

- Repo Rate vs. NIM (-0.85): A strong negative correlation suggests that lower repo rates lead to higher NIM, supporting banks' ability to earn on interest spreads.
- Repo Rate vs. ROA (-0.80) and ROE (-0.75): These negative correlations indicate that lower repo rates improve profitability, benefiting both asset returns and equity returns.
- Repo Rate vs. CIR (+0.70): A positive correlation suggests that higher repo rates increase operational costs, leading to reduced efficiency.

Interrelationships Among Profitability Metrics:

- NIM, ROA, and ROE are strongly correlated (above 0.85), confirming that improving interest margins enhances overall profitability.
- CIR negatively correlates with profitability metrics (-0.80 to -0.90), highlighting that cost efficiency plays a crucial role in maintaining profitability.

Insights:

- The strong negative correlation between repo rate and profitability metrics confirms that lower interest rates are favourable for banking profitability.
- The positive correlation between repo rate and CIR suggests that higher interest rates make banking operations costlier, reducing efficiency.

V. CONCLUSION

This study highlights the impact of interest rates on commercial bank profitability. Changes in interest rates influence key indicators like Net Interest Margin (NIM), Return on Assets (ROA), and Return on Equity (ROE). Higher interest rates increase borrowing costs, affecting profit margins, while lower rates boost profitability but may reduce NIM over time.

Commercial banks must adopt strategic interest rate risk management to maintain profitability. Optimizing lending rates and deposit costs is crucial for balancing revenue and stability. Macroeconomic factors such as inflation and GDP

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growth mediate the impact of interest rate changes on bank performance.Policymakers should design interest rate policies that promote financial stability and economic growth. Central banks must balance inflation control with fostering a strong banking environment.

For banks, enhancing risk management, diversifying revenue sources, and improving cost efficiency are essential. Aligning business models with interest rate trends helps mitigate risks from monetary policy shifts. Future studies can explore interest rate impacts in emerging economies and digital banking's role in managing such risks.

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