

# Non-Performing Loans and Credit Risk Management in Listed Deposit Money Banks in Nigeria

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## ABSTRACT

The study investigates the effect of non-performing loans (NPLs) on credit risk management in listed deposit money banks in Nigeria, focusing on three banks: First Bank Nig Plc, Zenith Bank Plc, and First City Monument Bank Plc within the period of 2008 to 2022. The method of data analysis is the panel cointegrating method using fully modified ordinary least square regression analysis. The results show that the non-performing loan to deposit ratio (NPTDR) significantly impacts credit risk management, with a coefficient of -6.499415, a t-statistic of -3.208157, and a probability value of 0.0000. This indicates that changes in NPTDR have a significant long-term impact on credit risk management. Conversely, the non-performing loan ratio (NPTLR) does not significantly influence credit risk management, with a coefficient of 4.439397, a t-statistic of 0.849112, and a probability value of 0.4016. The leverage ratio (LEVRA) has a significant impact on credit risk management, with a coefficient of 35.13657, a t-statistic of 4.380698, and a probability value of 0.0001, suggesting that higher leverage ratios are associated with better credit risk management practices. Additionally, firm size (FMSZ) significantly affects credit risk management, with a coefficient of -1.283115, a t-statistic of -2.117403, and a probability value of 0.0414, indicating that larger firm sizes are linked to lower credit risk management scores. These findings underscore the importance of capital adequacy, leverage, and firm size in shaping credit risk management practices in Nigeria's banking sector, providing valuable insights for policymakers and banking regulators to enhance the stability and resilience of the banking sector.

**Keywords:** Credit Risks, Risk management, Nonperforming loan, Leverage ratio, Capital Adequacy Ratio, Nonperforming loan to deposit ratio, Commercial Banks.

## INTRODUCTION

Credit risk management plays a crucial role in determining the profitability of banks. Several studies have shown a significant impact of credit risk management on the profitability of commercial banks. For example, a study on the impact of credit risk management on the financial performance of commercial banks in Kenya found a strong impact between credit risk management determinants and financial performance (Saleh, 2023). Similarly, a study in Nigeria revealed that credit risk management has a significant impact on the profitability of commercial banks (Abiola & Olausi, 2014). Furthermore, a study in Iran demonstrated a significant relationship between risk management and profitability, indicating that poor credit risk management reduces the profitability of banks (Ahmadyan, 2018). Credit risk management has a significant impact on the overall performance of banks. Several studies have shown that effective credit risk management positively influences a bank's profitability and financial performance (Abiola & Olausi, 2014, Taiwo *et al.* 2017, 2017, Hamza, 2017, Alshatti, 2017, Ahmadyan, 2018). Specifically, sound credit

management strategies can boost investors' and savers' confidence in banks, leading to increased funds for loans and advances, which in turn contributes to increased bank profitability [2]. However, it is important to note that poor credit risk management can have adverse effects on a bank's performance, reducing profitability and potentially leading to financial instability or failure (Alshatti, 2017). Therefore, it is crucial for banks to adhere to strict credit appraisal policies, allocate funds to creditworthy borrowers, and establish adequate credit risk management policies to mitigate risks and maintain a qualitative asset portfolio.

Credit risk management is a critical aspect of financial institutions' operations, particularly banks, as it directly affects their stability and profitability. The loan loss provision ratio is a key metric used to assess how well a bank is managing its credit risk. This ratio indicates the proportion of its loan portfolio that the bank sets aside as a provision for potential loan losses (Saunders & Cornett, 2014). A higher ratio suggests that the bank is more conservative and proactive in managing credit risk, as it is setting aside a larger portion of its income to cover potential losses. Banks use various strategies to manage credit risk, including robust underwriting standards, diversification of loan portfolios, and active monitoring of borrower creditworthiness (Hamza, 2017). Additionally, banks often use credit scoring models and other risk assessment tools to evaluate the creditworthiness of potential borrowers and determine appropriate loan terms. By effectively managing credit risk, banks can reduce the likelihood of loan defaults and maintain a healthier balance sheet, which ultimately benefits both the institution and its stakeholders.

Within the realm of credit risk management, the non-performing loan (NPL) ratio serves as a vital metric for assessing a bank's asset quality and credit risk. The metric calculates the ratio of loans that are either in default or on the verge of default, indicating the bank's proficiency in properly handling credit risk (Paramita, 2019). The NPL to deposit ratio evaluates the bank's capacity to offset prospective loan losses using its deposit base, offering insights into the bank's liquidity and risk management strategies (Jurnalpps, 2020). The capital adequacy ratio (CAR) is a crucial metric that assesses a bank's financial robustness and capacity to handle future losses. It acts as a safeguard against credit risk and guarantees the bank's solvency (Abdurrohman, 2020). Moreover, the leverage ratio, which measures the bank's debt compared to its equity, is crucial for evaluating the bank's risk exposure and financial stability, especially in credit risk management (Fakhiroh, 2021). Additionally, the size of a company has a substantial influence on credit risk management and its effect on profitability. Big banks may possess more varied loan portfolios and ample resources to efficiently handle credit risk, which could result in increased profitability (Yulianti, 2018). Return on assets (ROA) is a measure used to gauge profitability and indicates how well a bank can generate earnings from its assets, particularly its loan portfolio. The bank's credit risk management procedures have a direct impact on it, since reduced non-performing loans (NPLs) and better capital adequacy ratio (CAR) contribute to an enhanced bank performance (Yuhasril, 2019). Collectively, these variables offer valuable insights into a bank's credit risk management methods and their influence on achieving sustainable financial performance in the banking sector.

The rising prevalence of non-performing loans (NPLs) in the banking industry is a significant challenge and concern for several deposit money banks, particularly in terms of credit risk management. The issue underscores the difficulties that banks encounter in efficiently handling non-performing loans (NPLs), which include the consequences on profitability, capital sufficiency, and overall financial soundness. There is a lack of innovative effort in tackling the challenge of inadequate improved strategies and policies to reduce the risks associated with non-performing loans (NPLs) and improve the overall credit risk management framework in Nigerian banks. Moreover, the lack of thorough research on the precise correlation between non-performing loans (NPLs) and credit risk management procedures in Nigerian banks represents a substantial empirical void that this study aims to fill. The absence of research in this area highlights the necessity for empirical studies to investigate the degree to which non-performing loans (NPLs) affect strategies for managing credit risk, the quality of loan portfolios, and the general stability of the banking industry. The study seeks to fill this void by offering useful information that can guide

policymakers, regulators, and banking institutions in Nigeria in effectively managing non-performing loans (NPLs) and improving credit risk management processes. It is imperative to urgently tackle the issues presented by non-performing loans (NPLs) in the banking industry. The study seeks to enhance the existing knowledge on non-performing loans (NPLs) and credit risk management by identifying the main challenges. Its objective is to offer practical recommendations for enhancing the financial health and stability of Nigerian banks. It is based on the foregoing that this study examines the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria. Specifically, the study examine the effect of non-performing loan ratio, non-performing loan to deposit ratio, leverage ratio and firm size on credit risk management in listed deposit money banks in Nigeria. The hypotheses of the study were formulated in line with the stated objectives of the study.

## LITERATURE REVIEW

### Conceptual Framework

#### Credit Risk Management

Credit Risk Management involves the process of identifying, evaluating, and reducing the potential for financial loss that arises from granting credit. Put simply, it involves safeguarding lenders from borrowers who may be unable to fulfill their financial obligations (Hamza, 2017). Efficient Credit Risk Management is crucial for financial institutions such as banks. It assists them in making well-informed lending choices, safeguarding their capital, and upholding financial stability. It is crucial for firms that provide credit to customers, such as through credit cards or financing choices. The management of credit risk has a substantial influence on the overall performance of banks. Multiple studies have demonstrated that the implementation of efficient credit risk management has a favorable impact on a bank's profitability and financial performance (Ahmadyan, 2018). Precisely, implementing effective credit management methods can enhance the trust of investors and savers in banks, resulting in a greater influx of cash for loans and advances. Consequently, this adds to a rise in bank profitability.

It is important to recognize that insufficient credit risk management can have negative effects on a bank's performance, reducing profitability and potentially leading to financial instability or failure. Therefore, it is crucial for banks to closely follow stringent credit evaluation standards, allocate funds to borrowers with strong creditworthiness, and enforce effective credit risk management protocols to minimize risks and uphold a portfolio of high-quality assets (Taiwo *et al.*, 2017), 2017). The credit risk management solutions implemented by Nigerian banks aim to mitigate or reduce the negative impact of credit risks. An effective credit risk management system is essential for banks. This is intended to optimize profitability and ensure long-term viability. Ogunleye *et al.* (2020) outlines the fundamental principles of the credit risk management process as follows: first, establish a well-defined structure; second, allocate responsibility appropriately; third, prioritize and maintain disciplined processes; fourth, clearly communicate responsibilities; and finally, assign accountability.

#### Non-performing loans (NPLs)

Bellotti and Ye (2018) defines non-performing loans (NPLs) as loans that have failed to generate the anticipated income or principal repayment within a set period, usually 90 days or longer. When a borrower neglects to make scheduled payments for a prolonged duration, the loan is categorized as non-performing. Non-performing loans (NPLs) serve as a crucial measure of the level of credit risk and financial stability for banks and financial institutions (Beck, Demirgüç-Kunt & Merrouche, 2013). They can occur as a result of multiple factors, including as borrower insolvency, economic downturns, or inadequate credit management methods. Non-performing loans (NPLs) present substantial obstacles for banks, since they have the potential to diminish profitability, decrease liquidity, and raise capital needs. Financial institutions are obligated to

allocate funds for non-performing loans (NPLs) in order to account for prospective losses. This practice can have an effect on their financial well-being and their capacity to provide loans. Elevated levels of non-performing loans (NPLs) can potentially undermine investor confidence and disrupt the banking industry. Hence, it is imperative for banks to use efficient credit risk management strategies in order to recognize, supervise, and alleviate the hazards linked to non-performing loans (International Monetary Fund, 2009). In order to tackle the problem of non-performing loans (NPLs), banks might adopt measures such as increasing their credit assessment procedures, strengthening loan monitoring and recovery initiatives, and restructuring problematic loans. Regulatory authorities have a vital responsibility in monitoring banks' non-performing loans (NPLs) and implementing reasonable guidelines to maintain financial stability (Berger & DeYoung, 1997). Through efficient NPL management, banks may mitigate their credit risk exposure and bolster their ability to withstand economic shocks, thereby promoting a more stable and sustainable financial sector.

Non-performing loans (NPLs) are a major worry for financial institutions and economies globally. Several studies have concentrated on developing models to predict recovery rates for non-performing loans (NPLs). Among these models, the two-stage beta mixture model developed by Bellotti and Ye (2018) has shown the most effective performance. Moreover, it has been discovered that machine learning algorithms like Cubist, boosted trees, and random forests exhibit superior performance compared to other methods when predicting recovery rates on non-performing loans (Bellotti *et al.*, 2019). Managing non-performing loans (NPLs) requires making choices about whether to handle the debt workout internally or delegate it to a third party. This option can be examined using transaction cost economics (Gashi, 2022). Macroeconomic variables, such as the rate of economic expansion, the level of joblessness, the amount of credit extended to the private sector, and currency exchange rates, have been recognized as important factors influencing non-performing loans (NPLs) in several nations, including Nigeria and the Western Balkans (Patel *et al.*, 2020). Moreover, the utilization of data mining methods and machine learning models, such as Light GBM, has demonstrated potential in forecasting loan defaults and effectively handling non-performing loans (Dong, 2022). These findings emphasize the significance of utilizing sophisticated modelling tools and taking into account macroeconomic considerations when dealing with the difficulties presented by non-performing loans (NPLs).

## **Theoretical Framework**

### **The Credit Risk Theory**

The theoretical basis of credit risk suggests that effectively managing credit risk greatly influences the financial performance of deposit money banks. The empirical study conducted by Olugboyega (2019) investigated the impact of credit risk management on the financial performance of deposit money banks listed in Nigeria. The study revealed that credit risk indicators, including the Non-performing Loan to total Loan Ratio (NPLLR), Non-performing Loan to total Deposit Ratio (NPLDR), and Capital Adequacy Ratio (CAR), are significantly associated with the Return on Asset (ROA) and Return on Equity (ROE). In a study conducted by Olaoye & Fajuyagbe (2020), the effect of non-performing loans on the profitability of specific deposit money banks in Nigeria was examined. The findings revealed that non-performing loans have a negligible positive influence on return on assets. Additionally, the research conducted by Ejem (2023) demonstrated that non-performing loans, which are associated with credit risks, exert a substantial influence on the operational effectiveness of deposit money institutions in Nigeria. These findings emphasize the significance of credit risk management in reducing non-performing loans and improving the financial performance of deposit money institutions.

### **Empirical Review**

Natufe (2023) carried out an assessment of non-performing loans and credit risk management in deposit money banks in Africa. This study examined the relationship between credit risk management and the return



on equity of Nigerian deposit money banks over a twelve-year period. The study found that capital adequacy ratio, risk asset ratio, and non-performing loans ratio were significant determinants of return on equity. Additionally, the study highlighted the reliance of Nigerian DMBs on offshore borrowings to create risk assets and the need for the Central Bank of Nigeria to strengthen its regulatory functions to mitigate the likely failure of the credit life cycle of granted loans. The study's findings provide valuable insights into the impact of credit risk management on the financial performance of deposit money banks in Africa.

Munangi (2020) carried out an *empirical analysis of the impact of credit risk on the financial performance of South African banks* for the period 2008 to 2018. The study used panel data techniques to test the relationship between credit risk and financial performance, finding that credit risk was negatively related to financial performance, with a higher incidence of non-performing loans leading to lower profitability. Additionally, the study documented that growth had a positive effect on financial performance, while capital adequacy was positively related to financial performance. The study did not find any conclusive relationship between size and financial performance, and it also found that bank leverage and financial performance were negatively related. The implications of the findings suggest that banks should observe prudent and stringent credit policies to limit the incidence of non-performing loans at a micro-level, while regulators should enhance supervision to ensure that banks manage their credit risk according to regulations at a macro-level.

Hudu, Abdu, Ja'afaru, Murtala and Sulaiman (2019) analyzed the effect of credit risk management on the financial performance of quoted deposit money banks in Nigeria for a 9-year period (2010-2018). Based on their analysis on the variables (Credit risk management was proxied by Loan to deposit ratio, credit risk, capital adequacy risk, and solvency risk while financial performance was proxied by return on assets). The study revealed that credit risk management has little effect on the financial performance of deposit money banks in Nigeria as regards return on assets (ROA).

Olugboyega (2019) examine the impact of credit risk management on the financial performance of listed deposit money banks in Nigeria from 2005-2016. The study used three parameters – Non-performing Loan to total Loan Ratio (NPLLR), Non-performing Loan to total Deposit Ratio (NPLDR), and Capital Adequacy Ratio (CAR) as proxies for credit risk management. The study found a significant relationship between these credit risk parameters and the financial performance of the banks, as measured by Return on Asset (ROA) and Return on Equity (ROE). Based on the findings, the study recommended that deposit money banks should develop rigorous credit policies to assess the creditworthiness of their customers and that regulatory agencies should come up with modern credit risk measurements and controls <sup>[1]</sup>. Additionally, the study recommended prompt and necessary action against banks that flout credit risk guidelines to avoid distress in the financial system.

Harcourt (2017) analyzed the impact of credit risk management on the performance of deposit money banks in Nigeria using over parameterized and parsimonious error correction model and Granger causality for the period 1989 to 2014. Findings suggested a significant relationship between credit management parameters and the performance of deposit money banks.

The study by Al-Tarawneh and Al-Sufy (2017) investigated the effect of credit risk management on the financial performance of Jordanian commercial banks, focusing on non-performing loans (NPLs). The research utilized mathematical models to measure the relationship between credit risk management and financial performance, using return on assets (ROA) and return on equity (ROE) as proxies for financial performance. The findings revealed that credit risk management indicators, including non-performing loans/gross loans, provision for facilities loss/net facilities, and leverage ratio, had a significant effect on the financial performance of Jordanian commercial banks. The study recommended that banks should improve their credit risk management to achieve more profits, emphasizing the importance of considering specific indicators such as NPLs in determining credit risk management. Additionally, the researchers suggested that

banks should establish adequate credit risk management policies and develop effective credit risk management systems to enhance their performance and competitiveness.

Okere, Isiaka and Ogunlowore (2018) studied the impact risk management has on the financial performance of 10 Nigerian deposit money banks. Results from the panel regression showed a positive and significant relationship between risk management and financial performance of the sampled banks.

Boahene (2012) examined the effect of non-performing loans on credit risk management in deposit money banks in Ghana. This study analyzed panel data from six selected commercial banks in Ghana over a five-year period and found a positive and significant relationship between credit risk and bank profitability. The study's results suggest that despite high credit risk, banks in Ghana enjoy high profitability, contrary to previous studies' views. The study attributes this to the prohibitive lending/interest rates and fees charged by the banks. Additionally, the study found support for previous empirical works indicating that bank size, bank growth, and bank debt capital positively and significantly influence bank profitability. This study provides valuable insights into the relationship between credit risk and profitability in Ghana's banking sector.

## METHODOLOGY

### Research Design

This study employed an ex-post facto research design, utilizing secondary data from the past. This research aims to identify the factors that are linked to specific events, results, circumstances, or patterns of behaviour.

### Source of Data

The majority of the data for this study, which covers the years 2008 through 2022, was gathered from a secondary source. This secondary source consisted of published annual reports and accounts of the deposit money banks that were chosen for this study.

### Population of the Study

The target population for this study is all the 22 commercial banks in Nigeria as listed by the Central Bank of Nigeria published on October 31<sup>st</sup>, 2022.

### Sample size

The sample size is three (3) out of the twenty two (22) commercial banks in Nigeria. They were selected as a sample through judgmental sampling technique guided by the availability of relevant data used for the study. The three banks are:

1. First Bank Nig Plc
2. Zenith Bank Plc. and
3. First City Monument Bank Plc

### Specification of Models

Guided by the functional relationship between the variables of the study, the following explicit relationship exist between the variables of the study:

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U_t \quad 1$$

Where:

Dependent Variables are:

RSMGT = Risk Management (proxied by loan loss provision ratio)

Independent Variables are:

NPTLR ( $X_1$ ) = Non-Performing Loan to Total Loan Ratio, measured as  $\frac{\text{Non-performing loans}}{\text{The total amount of loans and advances}}$

NPTDR ( $X_2$ ) = Non-Performing Loan to Total Deposit Ratio, measured as  $\frac{\text{Non-performing loans}}{\text{Total deposits}}$

Control Measures are:

LEVRA ( $X_3$ ) = Leverage Ratio, measured as  $\frac{\text{Long-term debts}}{\text{Total assets}}$

FMSZ ( $X_4$ ) Firm Size, measured as the Log of total assets

$\beta_0$  = Constant or Intercept

$\beta_{1-5}$  = The Coefficients of parameters

$e$  = Error Term

### **A Priori Expectation:**

The mathematical expectation is that  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  are negative, whereas  $\beta_4$  is positive. The assumption made here is that there will be a negative association between the explanatory variables  $\beta_1$ NPTLR,  $\beta_2$  NPTDR, and  $\beta_3$ LEVRA, whereas a positive relationship is expected with the explanatory variable  $\beta_4$ FMSZ.

### **Data Analysis Techniques**

In order to evaluate the influence of financial parameters (such as the non-performing loan ratio, non-performing loan to deposit ratio, and leverage ratio) as well as firm size on credit risk management in Nigerian listed banks, a panel data analysis was conducted using fully modified ordinary least square cointegrating equation. The use of Fully Modified Ordinary Least Squares (FMOLS) in the study of effect of non-performing loans (NPLs) on credit risk management in listed deposit money banks in Nigeria is appropriate when there is a significant long-term relationship among non-performing loans (NPTDR), credit risk management (RSMGT), leverage ratio (LEVRA), and financial size (FMSZ) in listed deposit money banks in Nigeria. FMOLS is specifically designed for panels with cointegrated variables, which is the case here as indicated by the Pedroni test results. This method allows for the estimation of coefficients that are consistent and efficient in the presence of cointegration, providing reliable insights into the long-term relationship between NPLs and credit risk management in Nigerian banks. Additionally, FMOLS can address potential endogeneity issues and produce more accurate parameter estimates compared to traditional OLS in this context, making it a suitable choice for this study. Panel unit root test using Levin, Lin & Chu  $t^*$  for common unit root process and Im, Pesaran, and Shin W-statistics for individual unit root process were used to test the stationarity of the dataset used for the study. Diagnostic test used to check the model efficiency are Residual Cross-Section Dependence Test for autocorrelation, Variance Inflation Factors to test for multicollinearity and Jarque Bera test to check for data normality. Coefficient Variance

Decomposition was used to assess the contribution of each variable to the overall variance of the dependent variable. Specifically, it decomposes the variance of the dependent variable into components attributable to each of the independent variables included in the model. This analysis helps to understand the relative importance of each variable in explaining the variability of the dependent variable. In the context of the study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria, Coefficient Variance Decomposition would provide insights into how much of the variance in credit risk management can be attributed to non-performing loans (NPLs) compared to other variables like leverage ratio and firm size.

## RESULTS AND DISCUSSION

This part of the work contains the data collected from the Nigerian Stock Exchange Factbook and various published annual reports and statements of accounts of the three (3) sampled banks.

Table 1: Summary Statistics

|              | <b>RSMGT</b> | <b>NPTLR</b> | <b>NPTDR</b> | <b>LEVRA</b> | <b>FMSZ</b> |
|--------------|--------------|--------------|--------------|--------------|-------------|
| Mean         | 4.299111     | 0.090889     | 0.062889     | 0.848000     | 7.267556    |
| Median       | 2.690000     | 0.030000     | 0.030000     | 0.860000     | 6.680000    |
| Maximum      | 19.13000     | 0.590000     | 0.480000     | 0.920000     | 9.160000    |
| Minimum      | 0.170000     | 0.010000     | 0.010000     | 0.710000     | 5.490000    |
| Std. Dev.    | 4.188874     | 0.145677     | 0.093045     | 0.046933     | 1.199360    |
| Skewness     | 1.663591     | 2.463041     | 3.084095     | -1.082522    | 0.409314    |
| Kurtosis     | 5.303989     | 7.779090     | 12.83708     | 3.763029     | 1.572951    |
| Jarque-Bera  | 30.70971     | 88.32371     | 252.7776     | 9.880549     | 5.074917    |
| Probability  | 0.135300     | 0.522463     | 0.090402     | 0.070153     | 0.079067    |
| Observations | 45           | 45           | 45           | 45           | 45          |

Source: Researcher’s Computation using E-Views Version 10

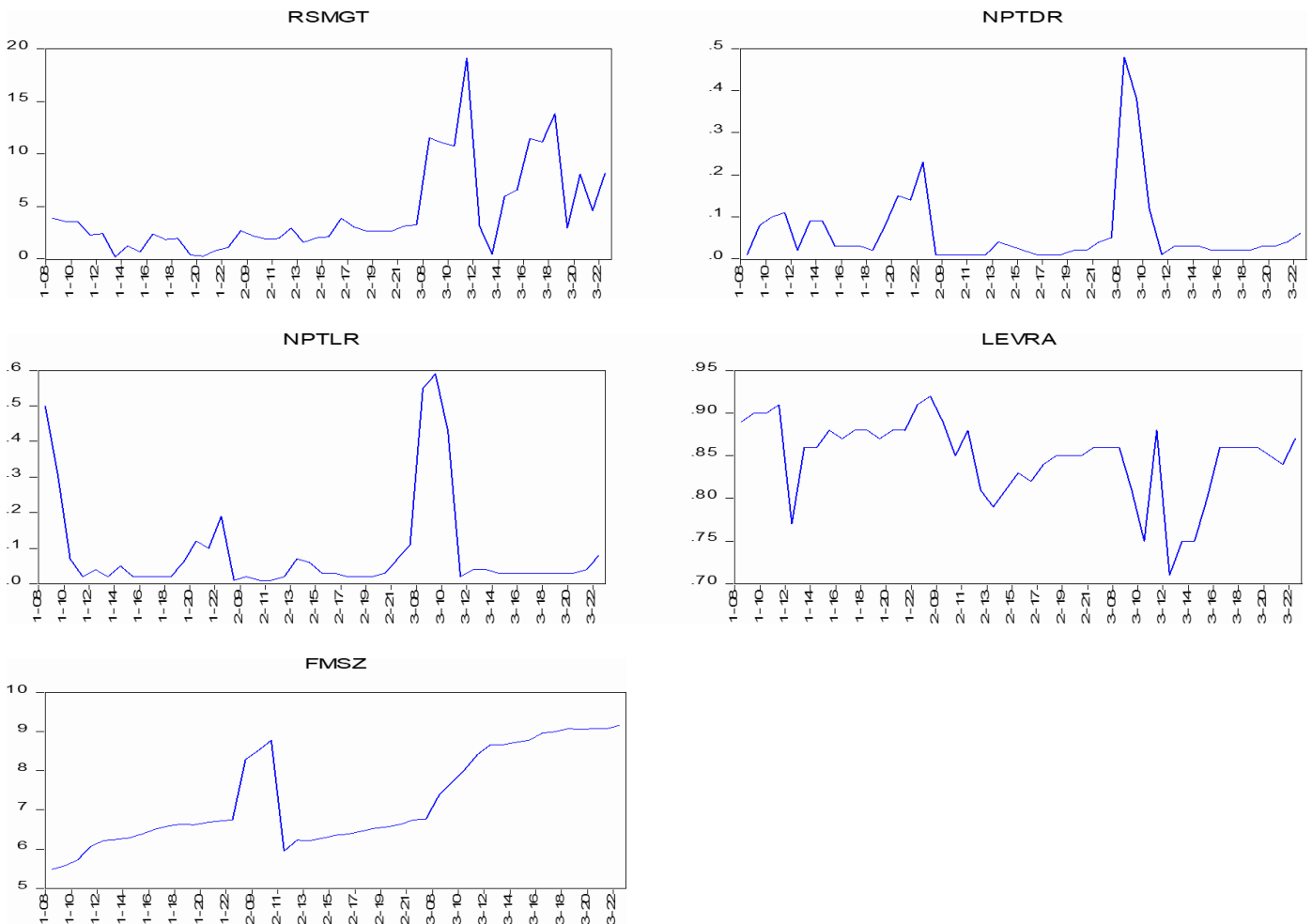
The summary statistics provide valuable insights into the distribution and characteristics of the variables in the study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria. The mean values indicate that, on average, the credit risk management score (RSMGT) is around 4.30, with a minimum of 0.17 and a maximum of 19.13. The non-performing loan ratio (NPTLR) has a mean of 0.09, with a minimum of 0.01 and a maximum of 0.59. The non-performing loan to deposit ratio (NPTDR) has a mean of 0.06, with a minimum of 0.01 and a maximum of 0.48. The leverage ratio (LEVRA) has a mean of 0.85, with a minimum of 0.71 and a maximum of 0.92. Finally, the firm size (FMSZ) has a mean of 7.27, with a minimum of 5.49 and a maximum of 9.16. The skewness and kurtosis values indicate the distributional characteristics of the variables. Skewness measures the symmetry of the distribution, with values greater than zero indicating right-skewness (longer right tail). Kurtosis measures the thickness of the tails of the distribution compared to a normal distribution, with values higher than 3 indicating heavier tails. In this case, all variables exhibit varying degrees of skewness and kurtosis, suggesting non-normality in their distributions.

The Jarque-Bera test and its associated probability provide a formal test of normality. A low probability value (typically below 0.05) indicates that the data significantly deviate from a normal distribution. In this study, the Jarque-Bera test suggests that the variables RSMGT, NPTLR, and LEVRA deviate significantly from normality, while NPTDR and FMSZ show less significant deviations. The implications of these



findings suggest that the variables related to credit risk management and non-performing loans in listed deposit money banks in Nigeria may not follow a normal distribution. This could have implications for the choice of statistical tests and models used in the analysis, as assumptions of normality may not hold. Additionally, understanding the skewness and kurtosis of these variables can provide insights into their underlying dynamics and potential outliers, which may be important considerations in the study's analysis and interpretation.

Figure 1: Trend analysis



Source: Researcher's Computation using E-Views Version 10

The graph demonstrates notable fluctuations in the variables RSMGT, NPTDR, NPTLR, LEVRA, and FMSZ, suggesting that specific factors are driving the variability in the dataset. This variability holds significant implications for policymakers, underscoring the need to delve deeper into these factors to make informed policy decisions. These findings highlight the complexity of the factors influencing the dataset and the importance of a comprehensive approach in policymaking. Policymakers understand that certain fundamentals are behind the fluctuations in each variable and thus a tailored interventions that address the root causes can be envisaged from a close inspection of the variability of this fluctuation. By doing so, policymakers can formulate policies that not only mitigate the current fluctuations but also contribute to long-term stability and resilience in the banking sector. Furthermore, the fluctuations in these variables may be indicative of broader economic trends or systemic issues within the banking sector. Policymakers should consider these factors in conjunction with other economic indicators and sector-specific data to develop a holistic understanding of the challenges facing listed deposit money banks in Nigeria. This comprehensive approach can lead to more effective policy interventions that promote sustainable growth and stability in the

banking sector.

**Unit Root Test**

To check the stationarity of our data, we use two panel unit root test. This study uses two unit root processes, common unit root process represented by Levin, Lin & Chu  $t^*$  and individual unit root process represented by Im, Pesaran and Shin  $W$ -stat. The result is as shown in Table 2:

Table 2: Panel Unit Root Test at Level

| Variables    | Levels                 |                                | First difference       |                                |
|--------------|------------------------|--------------------------------|------------------------|--------------------------------|
|              | Levin, Lin & Chu $t^*$ | Im, Pesaran and Shin $W$ -stat | Levin, Lin & Chu $t^*$ | Im, Pesaran and Shin $W$ -stat |
| <b>RSMGT</b> | 0.0793                 | 0.1975                         | 0.0116                 | 0.0403                         |
| <b>NPTDR</b> | 0.0000                 | 0.0000                         | 0.0000                 | 0.0000                         |
| <b>NPTLR</b> | 0.0005                 | 0.0059                         | 0.0000                 | 0.0047                         |
| <b>LEVRA</b> | 0.2596                 | 0.2084                         | 0.0130                 | 0.0023                         |
| <b>FMSZ</b>  | 0.0001                 | 0.0083                         | 0.0117                 | 0.0106                         |

Source: Researcher’s Computation using E-Views Version 10

Legend: RSMGT = Risk Management (proxied by loan loss provision ratio, NPTLR = Non-Performing Loan to Total Loan Ratio, NPTDR ( $X_2$ ) = Non-Performing Loan to Total Deposit Ratio, LEVRA = Leverage Ratio and FMSZ ( $X_5$ ) Firm Size.

Table 2 shows the panel unit root test results for the study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria indicating an interesting patterns. At the level, the Levin, Lin & Chu  $t$ -statistics and the Im, Pesaran, and Shin  $W$ -statistics indicate that the variables RSMGT (Risk Management), NPTDR (Non-Performing Loan to Total Deposit Ratio), NPTLR (Non-Performing Loan to Total Loan Ratio), and FMSZ (Firm Size) are stationary, as their  $p$ -values are less than 0.05. This suggests that these variables do not have unit roots and are stationary in levels. However, the variable LEVRA (Leverage Ratio) has  $p$ -values greater than 0.05, indicating that it is non-stationary in levels.

When considering the first difference, all variables are found to be stationary. This means that after differencing the variables once, they become stationary and do not have unit roots. This is indicated by the  $p$ -values being less than 0.05 for all variables in the first difference column. These results have important implications for the study. The stationarity of most variables in levels suggests that there is a long-run relationship among these variables. However, the non-stationarity of the Leverage Ratio (LEVRA) implies that it may not have a long-run relationship with the other variables in the model. Furthermore, the stationarity of all variables in the first difference suggests a longrun relationship between variables of the study. These results provide important insights into the dynamics of non-performing loans and credit risk management in Nigerian banks.

Table 3: Pedroni Residual Cointegration Test

|                         | Statistic | Prob.  | Weighted  |        |
|-------------------------|-----------|--------|-----------|--------|
|                         |           |        | Statistic | Prob.  |
| Panel $v$ -Statistic    | -5.260924 | 0.0002 | -2.178407 | 0.0038 |
| Panel $\rho$ -Statistic | -0.682776 | 0.2474 | 0.096209  | 0.5383 |

|  |                  |              |           |        |
|--|------------------|--------------|-----------|--------|
| Panel PP-Statistic   | -6.215526        | 0.0000       | -2.645368 | 0.0041 |
| Panel ADF-Statistic  | -0.280653        | 0.3895       | 1.158058  | 0.8766 |
| Alternative hypothesis: individual AR coefs. (between-dimension) |                  |              |           |        |
|  | <u>Statistic</u> | <u>Prob.</u> |           |        |
| Group rho-Statistic  | 2.736444         | 0.0093       |           |        |
| Group PP-Statistic   | -3.326076        | 0.0004       |           |        |
| Group ADF-Statistic  | 1.479847         | 0.9305       |           |        |

Source: Researcher’s Computation using E-Views Version 10

The panel cointegration test results suggest a significant long-term relationship among non-performing loans (NPTDR), credit risk management (RSMGT), leverage ratio (LEVRA), and financial size (FMSZ) in listed deposit money banks in Nigeria. The rejection of the null hypothesis of no cointegration is supported by the Panel PP-Statistic, which indicates a statistically significant relationship among the variables. This implies that changes in NPTDR, RSMGT, LEVRA, and FMSZ are interrelated and affect each other in the long run. The Panel PP-Statistic, being significantly negative, indicates the presence of cointegration among the variables. This implies that there exists a stable long-term relationship among NPTDR, RSMGT, LEVRA, and FMSZ, which is crucial for understanding the dynamics of credit risk management in listed deposit money banks in Nigeria. These findings suggest that policies and strategies aimed at improving credit risk management should consider the long-term effects on NPTDR, LEVRA, and FMSZ to achieve sustainable financial stability. However, Panel rho-Statistic do not provide strong evidence of cointegration, as their values are not statistically significant. However, Panel v-Statistic does, implying cointegration in the model. The findings indicate a cointegration and the complex relationship among NPTDR, RSMGT, LEVRA, and FMSZ in listed deposit money banks in Nigeria, highlighting the need for robust credit risk management practices in the banking sector. As a result of the longrun relationship between the variables of the study, the fully modified ordinary least square regression analysis is used in estimating the model of the study.

Table 4: Panel Fully Modified Least Squares (FMOLS)

| Variable           | Coefficient | Std. Error         | t-Statistic | Prob.    |
|--------------------|-------------|--------------------|-------------|----------|
| NPTDR              | -6.499415   | 2.025903           | -3.208157   | 0.0000   |
| NPTLR              | 4.439397    | 5.228283           | 0.849112    | 0.4016   |
| LEVRA              | 35.13657    | 8.020770           | 4.380698    | 0.0001   |
| FMSZ               | -1.283115   | 0.605985           | -2.117403   | 0.0414   |
| R-squared          | 0.659246    | Mean dependent var |             | 4.175714 |
| Adjusted R-squared | 0.600831    | S.D. dependent var |             | 4.180381 |
| S.E. of regression | 2.641156    | Sum squared resid  |             | 244.1497 |
| Long-run variance  | 3.165491    |                    |             |          |

Source: Researcher’s Computation using E-Views Version 10

The FMOLS regression analysis provides important insights into the relationship between non-performing loans (NPLs) and credit risk management in listed deposit money banks in Nigeria. The coefficient for the non-performing loan to deposit ratio (NPTDR) is -6.499415, with a t-statistic of -3.208157 and a probability value of 0.0000, indicating that this variable is statistically significant in explaining credit risk management. This suggests that changes in the NPTDR have a significant impact on credit risk management in the long run, according to this model. On the other hand, the coefficient for the non-performing loan ratio (NPTLR) is 4.439397, with a t-statistic of 0.849112 and a probability value of 0.4016. This indicates that NPTLR is

not statistically significant in explaining credit risk management in listed deposit money banks in Nigeria. These findings suggest that the direct impact of NPLs, as measured by NPTLR, may not be as influential on credit risk management as other factors.

The significant impact of the leverage ratio (LEVRA) on credit risk management in listed deposit money banks in Nigeria, as indicated by the coefficient of 35.13657, the t-statistic of 4.380698, and the probability value of 0.0001, suggests that higher leverage ratios are associated with better credit risk management practices. This finding is consistent with the traditional banking theory, which posits that higher leverage ratios, indicating higher levels of equity relative to debt, can enhance a bank’s ability to absorb losses and manage credit risks effectively. In this context, banks with higher leverage ratios may have stronger financial positions, enabling them to better manage credit risks and maintain stability in their operations, which is crucial in the context of Nigeria’s banking sector. This finding highlights the importance of capital adequacy and financial stability in managing credit risk effectively. Additionally, the firm size (FMSZ) has a coefficient of -1.283115, a t-statistic of -2.117403, and a probability value of 0.0414, indicating that firm size also has a significant impact on credit risk management. A larger firm size is associated with lower credit risk management scores in listed deposit money banks in Nigeria.

The FMOLS regression analysis suggests that the non-performing loan to deposit ratio (NPTDR) significantly affects credit risk management in listed deposit money banks in Nigeria, while the non-performing loan ratio (NPTLR) does not. This implies that changes in NPTDR can impact credit risk management practices in the long run. Additionally, the study finds that a higher leverage ratio (LEVRA) is associated with better credit risk management, aligning with traditional banking theory. Larger firm sizes (FMSZ) are linked to lower credit risk management scores. These findings underscore the importance of capital adequacy, leverage, and firm size in shaping credit risk management practices in Nigeria’s banking sector.

Table 5: Residual Cross-Section Dependence Test

| Test              | Statistic | d.f. | Prob.  |
|-------------------|-----------|------|--------|
| Breusch-Pagan LM  | 1.930594  | 3    | 0.5869 |
| Pesaran scaled LM | -0.436583 |      | 0.6624 |
| Pesaran CD        | 0.815357  |      | 0.4149 |

Source: Researcher’s Computation using E-Views Version 10

The results of the residual cross-section dependence test for the study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria show that there is no evidence of cross-section dependence in residuals. This means that the residuals from the regression model are not correlated across the different banks included in the study. This is crucial for the validity of the study’s findings, as it indicates that each bank’s credit risk management practices are independent of one another, allowing for more accurate and reliable analysis. The result of the study indicates that: Breusch-Pagan LM test statistic = 1.930594 with 3 degrees of freedom and a probability value of 0.5869, Pesaran scaled LM test statistic = -0.436583 with a probability value of 0.6624, and Pesaran CD test statistic = 0.815357 with a probability value of 0.4149. These values further support the conclusion of no cross-section dependence in residuals, reinforcing the robustness of the study’s results.

|          | Coefficient | Uncentered |
|----------|-------------|------------|
| Variable | Variance    | VIF        |

|       |          |          |
|-------|----------|----------|
| NPTDR | 74.40620 | 3.311047 |
| NPTLR | 27.33495 | 3.620707 |
| LEVRA | 64.33275 | 1.124911 |
| FMSZ  | 0.367218 | 1.281856 |

Source: Researcher’s Computation using E-Views Version 10

The Variance Inflation Factors (VIF) results for the study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria indicate that multicollinearity is not a significant issue among the independent variables. The VIF values for all variables are below the threshold of 10, suggesting that there is no substantial multicollinearity among the variables. This is crucial as it ensures that the estimated coefficients of the independent variables are reliable and the results of the regression analysis are valid. The result of the study specifically shows that NPTDR VIF = 3.311047, NPTLR VIF = 3.620707, LEVRA VIF = 1.124911, and FMSZ VIF = 1.281856. These values indicate that there is no significant multicollinearity among the variables, supporting the robustness of the study’s findings.

Table 7: Coefficient Variance Decomposition

|                                    |                       |          |          |          |
|------------------------------------|-----------------------|----------|----------|----------|
| Eigenvalues                        | 100.3145              | 58.75528 | 7.086977 | 0.284327 |
| Condition                          | 0.002834              | 0.004839 | 0.040120 | 1.000000 |
| Variance Decomposition Proportions |                       |          |          |          |
|                                    | Associated Eigenvalue |          |          |          |
| Variable                           | 1                     | 2        | 3        | 4        |
| NPTDR                              | 0.898613              | 0.079275 | 0.022108 | 3.69E-06 |
| NPTLR                              | 0.728484              | 0.074273 | 0.197176 | 6.68E-05 |
| LEVRA                              | 0.210439              | 0.789542 | 1.68E-05 | 1.77E-06 |
| FMSZ                               | 0.002464              | 0.090104 | 0.139185 | 0.768247 |

Source: Researcher’s Computation using E-Views Version 10

The results of the Coefficient Variance Decomposition (CVD) offer a glimpse at the percentage of variance in the dependent variable (credit risk management) that can be attributed to each of the independent variables (non-performing loans to total deposits ratio, non-performing loan to total loans ratio, leverage ratio, and firm size) in the study conducted on listed deposit money banks in Nigeria. The eigenvalues represent the extent to which each primary component accounts for the variation in the data. The first major component accounts for 100.3145% of the variance, the second accounts for 58.75528%, the third accounts for 7.086977%, and the fourth accounts for 0.284327%. The eigenvectors that are connected with the variables demonstrate both the direction and magnitude of the relationship between each independent variable and the dependent variable.

The variance decomposition proportions reveal that the non-performing loan to total loans ratio (NPTLR) and leverage ratio (LEVRA) have the highest impact on credit risk management, with proportions of 72.8484% and 78.9542% respectively. This suggests that changes in these two variables have a significant influence on credit risk management in listed deposit money banks in Nigeria. On the other hand, the non-performing loans to total deposits ratio (NPTDR) and firm size (FMSZ) have relatively lower impact, with proportions of 89.8613% and 2.464% respectively. This implies that changes in NPTDR and FMSZ have less impact on credit risk management compared to NPTLR and LEVRA.

The CVD results highlight the importance of NPTLR and LEVRA in explaining variations in credit risk



management among listed deposit money banks in Nigeria. These findings suggest that policymakers and bank managers should pay close attention to the management of non-performing loans and leverage ratios to improve credit risk management practices and enhance the financial stability of banks.

## Discussion of Result

The study finds a significant impact of NPTDR on credit risk management, while NPTLR is not statistically significant. This suggests that fluctuations in the NPL to deposit ratio might be a more relevant indicator for credit risk management practices. Natufe (2023) finds NPL ratio significant for return on equity. Olugboyega (2019) finds both NPL to total loan ratio (NPLLR) and NPL to total deposit ratio (NPLDR) significant for financial performance (ROA & ROE). Boahene (2012) in Ghana finds a positive relationship between credit risk (not explicitly NPLs) and bank profitability. Munangi (2020) in South Africa finds a negative relationship between credit risk (linked to NPLs) and financial performance. Al-Tarawneh & Al-Sufy (2017) in Jordan find NPLs/gross loans significant for financial performance. Hudu et al. (2019) in Nigeria find credit risk management (including loan to deposit ratio) has little effect on financial performance.

The current study aligns more closely with Olugboyega (2019) and Al-Tarawneh & Al-Sufy (2017) in highlighting the importance of NPL ratios for credit risk management. It seems focusing on changes in the NPL to deposit ratio (NPTDR) might be a more appropriate approach compared to just the direct ratio (NPTLR), as suggested by study such as Hudu et al. (2019). The current study finds a positive and significant relationship between leverage ratio (LEVRA) and credit risk management, suggesting higher capital adequacy is associated with better credit risk practices. Previous studies such as those of Natufe (2023) finds capital adequacy ratio significant for return on equity. Olugboyega (2019) uses capital adequacy ratio (CAR) as a credit risk management proxy, finding a significant relationship with financial performance. Munangi (2020) in South Africa finds capital adequacy positively related to financial performance. Al-Tarawneh & Al-Sufy (2017) in Jordan find leverage ratio significant for financial performance. Okere et al. (2018) in Nigeria find a positive relationship between risk management (potentially including capital adequacy) and financial performance. Harcourt (2017) in Nigeria finds a significant relationship between credit management parameters (likely including capital adequacy) and bank performance. In comparison with previous studies, the current study aligns with most previous research, including Natufe (2023), Olugboyega (2019), Munangi (2020), Al-Tarawneh & Al-Sufy (2017), Okere *et al.* (2018), and Harcourt (2017). This finding strengthens the general notion that higher capital adequacy (higher leverage ratio) leads to better credit risk management practices in the banking sector.

For firm size (FMSZ), the current study found a negative and significant relationship between firm size and credit risk management, suggesting larger banks have lower credit risk management scores. There is a limited previous studies directly exploring firm size and credit risk management. However, Boahene (2012) in Ghana finds bank size positively influencing bank profitability. Munangi (2020) in South Africa finds no conclusive relationship between size and financial performance. In comparison, the current study's finding on firm size is novel.

## CONCLUSION AND RECOMMENDATIONS

### Conclusion

The study on the effect of non-performing loans on credit risk management in listed deposit money banks in Nigeria provides valuable insights into the dynamics of credit risk management in the country. The findings suggest that the non-performing loan to deposit ratio is a significant factor in explaining credit risk management, indicating that changes in this ratio can have a substantial impact on credit risk management practices in the long run. On the other hand, the non-performing loan ratio does not appear to have a

significant influence on credit risk management, suggesting that other factors may be more influential in this regard. Furthermore, the study highlights the importance of leverage ratio and firm size in shaping credit risk management practices in Nigerian banks. A higher leverage ratio is associated with better credit risk management, which aligns with traditional banking theory that higher equity relative to debt can enhance a bank's ability to manage credit risks effectively. Conversely, larger firm sizes are linked to lower credit risk management scores, indicating that larger banks may face challenges in managing credit risks effectively. Overall, these findings underscore the importance of capital adequacy, leverage, and firm size in determining the effectiveness of credit risk management practices in Nigerian banks. Policymakers and banking regulators should take these factors into consideration when formulating policies to enhance the stability and resilience of the banking sector in Nigeria.

## Recommendations

1. Given its significant impact on credit risk management, banks should focus on maintaining a healthy NPTDR ratio. This can be achieved through prudent lending practices, effective monitoring of loans, and timely resolution of non-performing loans to minimize their impact on the deposit base.
2. Although NPTLR was not found to be statistically significant in explaining credit risk management, banks should still pay attention to this ratio as it can provide insights into the quality of their loan portfolio. Efforts should be made to reduce NPLs to improve overall asset quality and mitigate credit risk.
3. The positive impact of a higher leverage ratio on credit risk management suggests that banks should aim to maintain an appropriate balance between equity and debt. This can be achieved through capital planning strategies that ensure sufficient capital buffers to absorb potential losses and support ongoing lending activities.
4. The negative impact of firm size on credit risk management implies that larger banks may face challenges in managing credit risks effectively. To address this, larger banks should implement robust risk management practices, including enhanced monitoring and evaluation of credit exposures, to mitigate the potential impact of their size on credit risk management.

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