European Journal of Marketing and Management Sciences
Eur. J. M. Man. Sci.
Volume: 7; Issue: 03,
March-April, 2024
ISSN: 2263-6684
Impact Factor: 4.08

Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ejmms/index/

SUSTAINABLE CREDIT RISK MANAGEMENT AND THEIR INFLUENCE ON FINANCIAL STABILITY IN NIGERIA'S FINANCIAL SERVICES SECTOR

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Keywords: *Credit, Financial, Management, Risk, Sustainable*

Abstract

The study examined Sustainable Credit Risk Management and its Influence on Financial Stability in Nigeria's Financial Services Sector. The specific objectives are to: Examine the effect of loan impairment to total loans ratio on Financial Stability in Nigeria's Financial Services Sector. Assess the effect of total loan to total assets on Financial Stability in Nigeria's Financial Services Sector. The study employed an ex post facto research approach because the required data was already included in the financial statements and annual reports of Nigeria's financial services sector. The audited annual reports of the chosen financial services companies in Nigeria provided the time series data from 2013 to 2022. Descriptive statistics, including the Durbin Watson, Skewness, Kurtosis, and Jacbera statistics as well as the measure of central tendency, were used to describe the data. Correlation analysis was used to determine the kind and strength of the relationships between the variables. The results revealed that Loan impairment to total loan ratio has a nonsignificant positive relationship with return on capital employed with a value of P>|t| = 0.786 > 0.05, t-statistic <|2| at 0.27. While the Total loan to total assets ratio has a significant negative relationship with the return on capital employed with a value of P>|t| = 0.016< 0.05, t-statistic > |2| at -2.43 in Nigeria's Financial Services Sector. The study concluded that Sustainable Credit Risk Management has a significant not positive Influence on Financial Stability in Nigeria's Financial Services Sector. The study recommended among others that financial institutions should continue to enhance credit risk monitoring frameworks to reduce the occurrence of impaired loans.

1.1 Introduction

Sustainable Credit Risk Management (SCRM) has become vital in fostering financial stability within the global financial system. As financial institutions face an increasingly complex risk landscape influenced by economic, environmental, and social factors, SCRM seeks to integrate Environmental, Social, and Governance (ESG) considerations into traditional credit risk assessments (Kaimu, &

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Muba, 2021). By evaluating borrowers' sustainability practices and resilience, SCRM offers a holistic approach to credit risk, aiming not only to protect lenders from default risks but also to promote long-term economic stability (Adeusi, et al 2023). This shift is driven by the growing recognition that sustainable practices can reduce exposure to future risks associated with climate change, resource scarcity, and evolving regulatory standards, which can all impact a borrower's financial health (Muigai, 2016).

Incorporating sustainable credit risk management practices enhances financial stability by encouraging financial institutions to align their portfolios with responsible lending principles. By assessing factors like carbon footprint, social impact, and governance standards in their credit evaluations, lenders can better anticipate and mitigate risks that might arise from unsustainable business practices (Hamisu, et al 2021). This proactive approach enables banks and financial institutions to avoid exposure to borrowers with high environmental or social risks, which could lead to financial losses or reputational damage. Furthermore, SCRM encourages lenders to support businesses that contribute positively to the economy and society, strengthening the resilience of the financial system as a whole (Adewale et al 2020). In Nigeria, where financial institutions are central to economic growth, implementing sustainable credit risk management is essential for fostering financial stability. Traditional credit risk management has focused primarily on financial metrics, but rising awareness of climate risks, social issues, and governance challenges has underscored the need for a broader approach (Hamisu, et al 2021). SCRM encourages banks and financial institutions to evaluate borrowers' sustainability practices, environmental impact, and governance structures in addition to their creditworthiness. By doing so, these institutions can make more informed lending decisions, reduce exposure to long-term risks, and enhance resilience against economic shocks (Al-Eitan, & Bani-Khalid, 2019).

However, despite its benefits, the adoption of SCRM in Nigeria faces barriers such as limited ESG data, lack of regulatory incentives, and the need for expertise in evaluating non-financial risks. This study examines the influence of sustainable credit risk management on the stability of Nigeria's financial sector, analyzing how SCRM practices contribute to financial resilience and the challenges of implementing these practices within the local context. Ultimately, this exploration aims to provide insights into the role of SCRM in promoting a stable, responsible, and sustainable financial services sector in Nigeria.

Nigeria's financial services sector plays a pivotal role in driving economic growth and ensuring financial stability. However, the sector faces mounting challenges from economic volatility, environmental risks, and evolving regulatory expectations, which increasingly pressure financial institutions to adopt Sustainable Credit Risk Management (SCRM) practices. Sustainable credit risk management integrates

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Environmental, Social, and Governance (ESG) factors into traditional credit assessment frameworks to mitigate long-term risks and support responsible lending. While SCRM has the potential to strengthen financial stability by reducing exposure to unsustainable business practices, its adoption in Nigeria remains limited, hampered by inadequate ESG data, high implementation costs, and a lack of regulatory incentives.

Despite growing awareness of sustainability's importance, Nigerian financial institutions often struggle to incorporate ESG considerations into their credit risk models, focusing predominantly on traditional financial metrics. This limited adoption poses a threat to the sector's stability, as unaddressed environmental and social risks may lead to increased loan defaults, reputational risks, and economic vulnerability. There is currently insufficient research on how SCRM practices impact financial stability in Nigeria, creating a gap in understanding the benefits and challenges of integrating sustainable risk management into credit evaluation processes.

This study seeks to examine the influence of SCRM on financial stability in Nigeria's financial services sector, assessing both the opportunities it presents for risk reduction and the barriers to its adoption. The findings aim to provide insights into how SCRM can enhance resilience in Nigeria's financial system and offer recommendations for overcoming challenges to its effective implementation.

The main objective is to examine Sustainable Credit Risk Management and its Influence on Financial Stability in Nigeria's Financial Services Sector The specific objectives are to:

i. Examine the effect of loan impairment to total loans ratio on Return on Capital Employed in Nigeria's Financial Services Sector.
ii. Assess the effect of total loan to total assets on Return on Capital Employed in Nigeria's Financial Services Sector.
i. Loan impairment to total loan ratio has no significant effect on Return on Capital Employed in Nigeria's Financial Services Sector.
ii. Total loan to total assets ratio has no significant effect on Return on Capital Employed in Nigeria's Financial Services Sector.

Review of Related Literature

2.1 Conceptual Review

Sustainable Credit Risk Management (SCRM)

Sustainable Credit Risk Management (SCRM) refers to the integration of environmental, social, and governance (ESG) considerations into the assessment, monitoring, and mitigation of credit risk within financial institutions. This approach aligns traditional credit risk management practices with sustainable development goals, ensuring long-term economic stability while minimizing negative environmental and social impacts. To ascertain how banks could effectively manage their sustainability risks, we attempted to apply the Brundtland definition of sustainable development (Brundtland, 1987) to the degree of credit management in the banking

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industry (Jennings and Zandberger, 1995; Schmidheiny and Zorraquin, 1996). Additionally, we expanded ideas that incorporate social and economic risks (Gladwin et al., 1995) as well as environmental hazards (Hart, 1995) into credit management. The lender must rate several parameters that affect the borrower's capital stock, profitability, or liquidity. These elements affect a borrower's capacity to pay back the loan, which in turn affects the bank's credit risk.

Among the indications used in credit risk management to determine and control a borrower's risk are the balance sheet of the business, its quantitative indicators, and its qualitative indicators (like managerial abilities) (Caouette et al., 1998; Fitch, 1997; Saunders, 1999; Weber, 1997). We focused on the so-called counterparty credit risks in our study, which are primarily impacted by the debtor's reputation, repayment capacity, future profits, capital and debt ratio, and collateral value (Saunders, 1999). These variables may be strongly impacted by sustainability issues (Thompson, 1998b, Coulson and Dixon, 1995). Therefore, higher expenses of recommended investments in environmental technology may have an impact on a debtor's income.

thus, these investments reduce the debtor's liquidity and, thus, their capacity to repay the loan. Furthermore, the borrower's capital–debt ratio falls as a result of the requirement for more funding to invest in environmentally friendly end-of-pipe technologies, raising the bank's credit risk. Furthermore, a business borrower's site that is utilized as collateral may lose value, raising the bank's credit risk. Indirect factors may also have an impact on a borrower's income; for instance, low wages in developing nations may lead to boycotts by consumers, endangering the borrower's reputation. Environmental risk management in banks has been the primary focus of scientific studies on the management of sustainability credit risks in banks.

According to Scholz et al. (1995), environmental risks were implicated in roughly 10% of all credit losses in German banks. In a follow-up study, Weber (1997a) concluded that the primary causes of credit losses due to environmental issues were market changes brought on by the environment, environmental disasters, the reduction of securities due to contamination, and the costs incurred to address environmental issues mandated by a regulatory body. These hazards suggest that banks should give environmental credit risk management more weight when it comes to business financing (Nitsche and Hope, 1996; Thompson, 1998a).

Loan Impairment (LI) to Total Loans (TL)

Deposit Money Banks (DMBs) are required to make provisions in their financial statements and then pursue recovery when a loan is impaired. Loan impairment, also known as non-performing loans, is the proportion of the overall exposure for which recovery is either projected to be problematic or has already become difficult, whereas total loans refer to the whole exposure of DMBs at a specific point in time. Eniafe (2020) states that when principal and interest payments are not made for more than ninety days, a loan is

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considered impaired or non-performing and may be capitalized, rescheduled, or have its principal and interest rolled over. The following categories apply to impaired or non-performing loans:

i. When principal, interest, or both repayments are not made for 90 to 180 days, it is considered substandard.
ii. Doubtful: When no perfected tangible security is in the process of realization and principle or interest repayments, or both, are not made for 180 to 360 days.
iii. Lost: When principal, interest, or both are not repaid for more than 360 days. The ratio of loan impairment to total loan is determined by dividing the loan impairment charge by the entire loan amount. Loan Total (TL)/LI. (Eniafe, 2020) LI/TL.

Total Loan to Total Assets

This is used to track the percentage of financial services companies' assets that have been loaned out. If the loan is impaired or turns into a non-performing loan, it is a reliable indicator of how much the assets will be impacted. The loan-to-deposit ratio is a measure of the percentage of total assets invested in loans, according to Muhammad and Nuhu (2019). They also claim that it shows the bank's liquidity. Lower liquidity and higher bank profits are associated with higher ratios. According to Adesina and Olatise (2017), the ratio of the bank's total loans and advances to its total assets is known as the total loan to total assets.

This is measured as Total Loan (TL) divided by the Total Assets (TA), $\frac{TL}{TA}$

Financial stability

Financial stability has many different meanings. The majority of them agree that the absence of systemic incidents in which the financial system malfunctions (crises) is what defines financial stability (Čihák, and Heiko 2010). It also concerns how stress-resistant financial systems are. Effective resource allocation, risk assessment and management, preserving employment levels near the natural rate of the economy, and removing relative price movements of financial or real assets that could jeopardize employment levels or monetary stability are all capabilities of a stable financial system (World Bank. 2012). When a financial system corrects financial imbalances that develop naturally or as a result of major unanticipated and negative occurrences, it is said to be in a range of stability.

When there is instability, the system will largely use self-corrective mechanisms to absorb the shocks, avoiding negative occurrences from disrupting other financial systems or the actual economy. Since the financial system facilitates the majority of transactions in the actual economy, financial stability is essential for economic growth (Luc and Ross 2009). It is during times of financial instability that the genuine worth of financial stability is most evident. Banks are hesitant to fund successful ventures during these times, asset valuations diverge greatly from their underlying values, and payments might not be made on schedule (Beck, et al 2007). A stock market crash, hyperinflation, or bank runs might result from significant instability. It has the potential to seriously erode trust in the financial and economic system (Čihák, et al 2012).

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Return on Capital Employed (ROCE)

An additional useful indicator of profitability or performance is the return on capital employed or ROCE. It is the standard indicator of a business's capital efficiency and performance. A long-term profitability indicator of how well and efficiently a business uses its capital is the return on capital employed. It displays the amount of profit made by N1 for each capital employed or invested. Capital employed is equivalent to a company's equity plus non-current liabilities or total assets less current liabilities, according to Adegbie and Otitolaiye (2020). Put another way, all long-term assets, such as stockholders' equity and long-term debt, fall within the category of capital used by an organization. ROCE shows how profitable and efficient a company's capital investments are. To ascertain how the factors about credit risk may also impact profitability, this study used return on capital as a stand-in for profitability. It is calculated as earnings before interest and taxes (EBIT) divided by Capital Employed (CE).$\frac{EBIT}{CE}$

2.2 Theoretical Review

In the literature on finance management, a number of ideas have been proposed to explain financial difficulty. For example, according to the cash management theory, an organization would experience financial distress if there was a persistent mismatch between cash inflow and outflow (Aziz & Dar, 2006). A cash management failure is the cause of the cash flow mismatch. According to the principle, businesses must use their funds effectively and efficiently in order to avoid going into hardship. An imbalance between cash inflows and outflows caused by poor cash management frequently results in financial difficulties for the company. Another idea that explains why businesses experience financial trouble is the notion of credit risk.

According to this hypothesis, businesses may experience financial trouble if they fail to adequately manage their credit risk. The possibility that a counterparty won't fulfill its end of the bargain is known as credit risk. An organization's ability to survive is directly threatened by credit risk, which, if improperly managed, puts businesses in a precarious position. To recognize, evaluate, and manage credit risk inside an organization, a strong framework for credit risk management is necessary. Having a strong credit risk policy is also necessary for creating a solid foundation for managing credit risk. An organization's high credit risk is one of the first indicators of financial difficulty.

Financial distress has also been explained by the Pecking Order Theory. Donaldson first proposed the pecking order theory in 1961, but Myers and Majluf (1984) popularized and altered the idea. The theory states that to maintain the stability and value of the company, firms prefer to use their sources of funding before turning to external sources. Frequent use of external funding sources (debt) to fund business operations may put the company at risk of financial distress, particularly if it becomes impossible to satisfy ongoing obligations (Wesa & Otinga, 2018).

According to the pecking order hypothesis, an organization must balance the many sources of

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funding it has access to to maintain its financial stability and raise its worth (Muigai, 2016). Modigliani and Miller's (1963) trade-off hypothesis is one of the other theories of financial crises. According to this theory, using debt is advantageous for the company because it increases its value. However, there is a limit to the use of debt finance because, eventually, using debt continuously lowers the company's value and puts it at risk of financial distress. Additionally, this theory promotes an ideal capital structure, which can be achieved by weighing the advantages and disadvantages of employing debt.

2.3 Empirical Review

Adewale *et al* (2020) investigated the Influence of Risk Assets Impairment on the Performance of Nigerian Deposit Money banks. They employed secondary data, and used a fixed random effect regression analysis method, from a sample of 14 listed Nigerian banks, to analyze the data. They found out that while impairment loss has a significant negative relationship with operating profit, non-performing to a ratio has a significant positive relationship with return on assets. They recommended that bank directors should put in place an effective risk assets impairment test to boost reported profitability, Management of banks to ensure effective liquidity ratio management to boost return on equity while government policymakers are enjoined to ensure that banks disclose their risk asset impairment and expand their services to the unbanked.

Al-Eitan and Bani-Khalid (2019) examined the Impact of Credit Risk on the Financial Performance of Jordanian Commercial Banks covering the period from 2008 to 2017. They used panel data analyzed using random effect models and the GLS method to arrive at their conclusion. The result showed that credit risk has a negative and significant impact on return on assets and return on equity. The result further revealed that credit risk management measured by the ratio of doubtful debt, total loans, non-performing loans, and loan losses to total loans has a negative and significant impact on the performance of Jordanian banks. They recommended developing a strategy to monitor credit facilities grants, control customers enjoying credit facilities and assess their financial positions, and develop an analytical model that will aid credit risk management to predict the client situation and determine the probability of default and compliance with necessary measures to reduce the risk exposure of the bank.

Suman (2023) evaluated the effect of credit risk management on the financial performance of commercial banks in Nepal from 2017 to 2021. The research design adopted was a regression model, descriptive statistics, and comparative research design to analyze pooled data from 14 commercial banks in Nepal. The findings showed that the non-performing loan ratio had an insignificant indirect effect on return on assets. Capital adequacy ratio on the other hand had an insignificant positive effect on return on assets while bank size exerted a significant negative effect.

Kaimu and Muba (2021) studied to ascertain the relationship between credit risk and the financial performance of commercial banks in Tanzania

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from 2005 to 2019 using secondary data and an explanatory research approach. Data analysis was done using a Fixed and random effect model. The findings revealed that the non-performing loan ratio had a negative but insignificant association with return on assets. Capital adequacy ratio had a significant positive association with return on assets. The loan loss provision ratio showed a slight negative association with return on assets while loan-to-ban asset size had an insignificant positive relationship with return on assets.

Hamisu *et al* (2021) carried out a study to determine the effect of credit risk management on the financial performance of selected listed deposit money banks in Nigeria for a period covering 2015 to 2019. They used secondary data and adopted the ordinary least square regression estimation technique to analyze the data obtained. The findings revealed that total loans and advances had significant negative effects while non-performing loans had insignificant negative effects on return on assets.

Adeusi *et al* (2023) in their study assessed the impact of credit risk management on the performance of deposit money banks' performance in Nigeria from 2005 to 2019. Data obtained from annual reports of the banks were analyzed using ordinary least square regression techniques, OLS regression techniques, pairwise Granger causality tests, Johansen- Fisher co-integration tests, and Kao Residual co-integration tests. The result showed that loan to deposit ratio and loan-to-asset ratio had a weak negative association with bank performance measured by profit after tax.

3. Methodology

The study employed an ex post facto research approach because the required data was already included in the financial statements and annual reports of Nigeria's financial services sector. The study's primary focus was on financial services firms in Nigeria. The audited annual reports of the chosen financial services companies in Nigeria provided the time series data from 2013 to 2022. Its primary focus was on sustainable credit risk management and enhancing financial stability in Nigeria's financial services sector. The study's population consisted of the 49 publicly traded financial services firms operating in Nigeria as of December 31, 2022. Using the Taro Yamane formula, the sample size was determined to be 44. Descriptive statistics, including the Durbin Watson, Skewness, Kurtosis, and Jacbera statistics as well as the measure of central tendency, were used to describe the data. Correlation analysis was used to determine the kind and strength of the relationships between the variables. The alternative hypothesis (H1) was accepted by the choice rule if the modulus of the t-statistic >|2.0| for the independent variables had a positive or negative sign and the t-statistic's p-value was less than 0.05. Otherwise, accept H0 and reject H1.

Model Specification

The model below was used to determine how the various independent variables affected the return on capital employed.

$ROCE_{it} = \beta_0 + \beta_1 LITLR_{it} + \beta_2 TLTAR_{it} + \mu$

Where:

ROCE= Return On Capital Employed,

LITLR= Loan Impairment to Total Loan Ratio,

TLTAR= Total Loan to Total Assets Ratio

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Data Presentation and Analysis

4.1 Data Presentation

4.2 Data Analysis and Diagnostics

Table 4.2: Descriptive Statistics

Var.	Obs.	Mean Skewness	Median Kurtosis	Std. Dev.	Std. Err.	Prob.	Prob.	Min	Max
roce	170	.055	.040	.073	.006	0.0000	0.0000	-.346	.285
litlr	170	.104	.012	.809	.062	0.0000	0.0000	-0.004	10.377
tltar	170	.467	.466	.148	.011	0.0000	0.0000	.001	.928

Source: Author's STATA 14.2 Outputs, 2023

Interpretation of Descriptive Statistics

To determine the values shown in Table 4.2 above, the totaled numbers for the dependent and explanatory variables are combined and averaged. To put it another way, the means of the six variables—a strong indicator of central tendency although being susceptible to extreme values—of the financial services companies that were quoted in 170 observations are displayed above. It is anticipated that these sample means will closely resemble the actual population means of these businesses. However, because the tested enterprises are drawn from a variety of sub-sectors, it is not surprising that the standard deviation, a measure of dispersion, is as great as the means in comparison. This is one of the features of panel data.

The fact that the mean, standard deviation, and standard error are all present in the same measurements makes the largeness very clear. Additionally, as the sample gets closer to the population, the standard errors of the variable mean—the most useful estimators—become relatively small. The theoretical premise that these variables get smaller as the sample size gets closer to the population is supported by these variables.

Skewness is implied by standardized third moments. It alludes to the distribution's asymmetry concerning the sample mean. In comparison to the normal distribution, negative kurtosis shows flatness and light tails, whereas positive kurtosis shows peakedness and heavy tails. In this instance, for every variable entered, the probabilities of both moments are less than 1%.

Given that the P-values are statistically significant (P-value < 0.05), the entered variables are normally distributed. Range refers to the difference between maximum and minimum (247.048--10.045).

4.2.2 Normality Distribution Test

Table 4.3: Normality Tests (All-Inclusive Model)

Var.	Obs. Skewness	FranciaW Pro(skew)	Wilk W kurtosis	Pro (kurt)	Prob>chi2	Prob>z	Prob>z	Sharpiro
roce	170	0.9225	0.0000	10.0400	0.0000	0.0000	0.00001	0.00000
litlr	170	12.2118	0.0000	154.8202	0.0000	0.0000	0.00001	0.00000
tltar	170	0.0639	0.7238	3.7945	0.0548	0.1448	0.10981	0.22486

Source: Author's STATA 14.2 Outputs, 2023

Interpretation for Normality Tests

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Skewness, as defined in Table 4.3, is the distribution's asymmetry with respect to the sample mean. Positive kurtosis exhibits peakedness and heavy tails, whereas negative kurtosis indicates flatness and light tails. With the exception of the Total Loan to Total Assets Ratio, which is 14.5%, all entered variables had P-values (skewness and kurtosis) less than 1%. Return on Capital Employed and Loan Impairment to Total Loan Ratio showed skewness/kurtosis p-values of less than 1%, whereas the Total Loan to Total Assets Ratio showed p-values of 72% and 5.5%, respectively. The statistical relevance of having a normal distribution was highlighted by the combined P-values. Furthermore, p-values for Return on Capital Employed and Loan Impairment to Total Loan Ratio, excluding Total Loan to Total Assets Ratio, are below 5%, according to the results of the Sharpiro-Francia "W" and Sharpiro-Wilk "W" normality tests, which were conducted at 10% and 22%, respectively.

4.2.3 Tests for Stationarity

Table 4.4: Panel Data Stationarity (Presence of Unit Roots) Test

Levin-Lin-Chu unit-root test for all the Variables based on Augmented Dickey-Fuller tests Ho: All panels contain unit roots Number of panels (N) = 17 Ha: Panels are stationary Number of periods (T) = 10

Asymptotic: N / T0 $\rightarrow$

Var.	Panel	Panel Adjusted t*	1%	5%	P-values	Lags Unadjusted t
roce	-8.12	-8.82	-2.58	-1.95	0.000	1
litlr	-5.83	-6.33	-2.58	-1.95	0.000	1
tltar	-6.34	-1.07	-2.58	-1.95	0.142	1

Source: Author's STATA 14.2 Outputs, 2023

Since the number of periods tends to infinity and the number of panels is fixed within the relevant range, the Levin-Lin-Chu unit-root test was used in this case. This test assumes that the ratio T to N approaches zero. The p-values for every variable entered, except ROCE, are less than 1% at the 5% level of significance, which is the default for the majority of statistical analyses. Similarly, all data sets (except ROCE) showed adjusted t and unadjusted t* values greater than -1.95. These findings point to the lack of a unit root. In other words, the variables that were entered are stationary. On the other hand, ROCE's 99% and 95% confidence levels would have indicated otherwise.

4.2.4 Johanson Cointegration Tests

Sample (adjusted): 6 170 Included observations: 165 after adjustments
Trend assumption: Linear deterministic trend Series: roce, litlr, tltar
Lags interval (in first differences): 1 to 4 Unrestricted Cointegration Rank Test (Trace

Table 4.5: Panel Data Cointegration Tests

Traceo.05 Var.	Critical Elgenvalue	Statistic	Hypothesized Value	Lags Interval No. of CE(s)	Prob.***	(1-4)
roce	0.074689	12.80824	3.841466	None*	0.0003	1
litlr	0.176287	31.99905	3.841466	None*	0.0000	1
Tltar	0.137650	24.43559	3.841466	None*	0.0000	1

Source: Author's EVIEWS 10.0 Outputs, 2023

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The values of the eigen, trace statistics, the critical value at 5%, and the P-values for cointegrating each of the variables that were entered are shown in Table 4.5. Both the dependent variable (ROCE) and predictor variables are cointegrated, indicating a long-term relationship between them, as indicated by trace statistics for these variables exceeding the critical value (3.841466) and p-values below the 5% level of significance (α = 0.05) (Phillips and Moon, 1999). In other words, an error correction model, sometimes referred to as the random effects model, must be run for the entered variables. Since unit roots are present in the data set for the dependent variable (ROCE), it became essential. In other words, the Prais-Winston Regression Correlated Panels Corrected Standard Errors, one of the derivatives of the random effects model is the best since it is robust in addressing every issue found in the pooled dataset.

4.2.5 Pairwise Correlations

Table 4.6: Correlation Matrix with P-values involving 170 Observations

	roce	**litlr**	**tltar**
roce	1.0000		
litlr	-0.0450	1.0000	
Tltar	-0.1477	-0.2841*	1.0000
	0.0547	0.0002	

Source: Author's STATA 14.2 Outputs, 2023

Interpretation of Pearson Correlation Coefficient Matrix

The P-values and pairwise (Pearson) correlation coefficients for the firm-specific drivers of return on capital employed (ROCE) of the companies included in the study are shown in Table 4.6 above. The degree of relationship between the various variables is measured by the Pearson correlation coefficients. Each correlation coefficient's probability is lower than the others. Additionally, a superscript * highlights the substantial statistical significance of P-values below 5%. The table further indicated very strong positive associations of Loan Impairment to Total Loan Ratio while Total Loan to Total Assets Ratio; has very strong negative relationships between Total Loan to Total Assets Ratio, and Loan Impairment to Total Loan Ratio. These very strong relationships suggest existence of collinearity that characterizes panel data. At 5% level of significance, there exists no significant association between the dependent variable and explanatory variables. In addition, these insignificant statistical associations are all negative.

4.2.6 Test for Heteroskedasticity

Table 4.7: Breusch-Pagan Test for Heteroskedasticity

Bresuch-Pagan/Cook-Weisberg test for Heteroskedasticity

Ho: Constant variance
Variables: fitted values of return on capital employed (roce)
Chi2(1): = 5.86
Prob>chi2 = 0.0155

Source: Author's STATA 14.2 Outputs, 2023

European Journal of Marketing and Management Sciences
Eur. J. M. Man. Sci.
Volume: 7; Issue: 03,
March-April, 2024
ISSN: 2263-6684
Impact Factor: 4.08

Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ejmms/index/

Interpretation of Test for Heteroskedasticity

The Breusch–Pagan test result (heteroskedasticity) for the model specification is shown in Table 4.7 above. The outcome demonstrated that the model's error term's variance is non-constant. This means that the test is statistically significant because the P-value is less than 5 percent, or 0.0155, indicating that the alternative hypothesis (HA: non-constant variance), or the existence of heteroskedasticity, is accepted. Biased standard errors result if this is not fixed. To get robust standard errors, the robust command is used when doing the regression. Dependent and identically distributed mistakes are resolved by robust standard errors.

Furthermore, the coefficient estimates that the regression equations produce remain unchanged when these errors are used; only the standard errors and significance tests are altered.

4.2.7 Test for Multi-colinearity

Table 4.8: Variance Inflation factor

Variable	VIF	I/VIF
tltar	1.38	0.722096
litlr	1.09	0.917382
Mean VIF	**1.20**	

Source: Authors' STATA 14.2 Outputs, 2023

Interpretation of Tests for Multi-colinearity

Multi-colinearity (an unstable state of the regression model estimates, coefficients, and overstated standard errors for the coefficients) can be caused by limitations in the model or in the population being sampled, model misspecification, the data collection method, an overstated model, or regression sharing a common trend over time. One predictor variable and one or more explanatory variables have a (strong) linear relationship, which is measured by the variance inflation factor. The regression coefficients are poorly estimated when 5<VIF<10. According to the above-mentioned comprehensive model, the explanatory variables have a mean variance inflation factor (VIF) of 1.20< 2.0 with resulting VIFs ranging from 1.03 to 1.38.

The findings show that the explanatory variables in the pretest model did not exhibit multi-colinearity. Existing literature suggests that the combination of cross-sectional and time series data (panel data) may have contributed to the lack of multi-colinearity. However, factor analysis, variable transformation, variable removal, a priori information from theory, ridge regression, adding fresh data, and principle components analysis are the most likely methods to tackle the multi-colinearity problem. However, the existing literature indicates that colinearity, especially amongst explanatory variables (see Pairwise Correlations above), calls for the employment of adjusted Durbin Watson Statistics and co-linearity diagnostics.

4.2.8 Test for Model Mis-specification

Table 4.9: Ramsey RESET Mis-specification Test

Ramsey RESET test using powers of the fitted values of shprr
Ho: model has no omitted variables
F (3, 131) = 11.78
Prob> F = 0.0000

Source: Author's STATA 14.2 Outputs, 2023

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Interpretation of Test for Model Mis-Specification

The Ramsey Reset test is used in table 4.9 above to determine whether the comprehensive model is over- or under-specified. Rerunning the regression after eliminating one or more explanatory variables is how it is accomplished. The model is not over-fitted, according to an analysis of the old and new residuals. Put another way, the P-value = 0.0020 < 5 indicates that the alternative hypothesis (HA) is accepted and that the hypothesis (Ho) is rejected, meaning that the model contains variables that are not included. Alternatively, the same result is achievable using the formula:

$F_{calc} = \frac{(R^2_{new} - R^2_{old})/\text{number of new predictors}}{(1-R^2_{new})/(\text{n- number of betas in the new model})}$

4.2.9 Hausman Test for All-Inclusive Model Validity

Table 4.10: Hausman Test of systematic difference in coefficients

```
. hausman fixed random

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |    fixed        random       Difference          S.E.
-------------+----------------------------------------------------------------
       litlr |   .0535944     .0332319         .0203624                .
         car |  -.0023271    -.0015089        -.0008182                .
        lier |    .078196     .0373967         .0407993        .0049513
       tltdr |  -.0107845    -.0055989        -.0051855        .0067767
       tltar |  -.0142076    -.0325737          .018366         .002062
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       40.10
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

Source: Author's STATA 14.2 Outputs, 2023

Table 4.10 above facilitates a choice between error correction model i.e. random effect model (REM) and fixed effects model (FEM). The result of the Hausman test shows a p-value less than 0.05 (Prob< chi2 = 0.0000). That is, the alternate hypothesis (H_A) is accepted signaling that difference in coefficients is systematic but efficient under b i.e. fixed effect model. This result, further, strengthens the stationarity and cointegration results. The algebraic equation of the RE model is given as:

$Y_{it} = \beta_k X_{it} + \alpha i + u_{it}$ Where

αi (i=1....17) is the unknown intercept for each entity (17 entity-specific intercepts),
Y_{it} is the dependent variable ($ROCE_{it}$) where i = firm (1- 17) and t = time (1-10),
X_{it} represents independent and control variables
β_k is the coefficients for the individual firm characteristics and
αi is the disturbance term while u_{it} is the error term.

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4.2.10 Multiple Regressions (Panel Least Squares)

Table 4.11: Prais-Winsten Regression

Prais-Winsten AR(1) regression -- iterated estimates

Source	SS	df	MS		
Model	.034179743	5	.006835949	Number of obs	= 170
Residual	.614683855	164	.003748072	F(5, 164)	= 1.82
Total	.648863598	169	.00383943	Prob > F	= 0.1109
				R-squared	= 0.0527
				Adj R-squared	= 0.0238
				Root MSE	= .06122

roce	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
litlr	.0067585	.0248955	0.27	0.786	-.0423986	.0559155
car	-.0004894	.0010344	-0.47	0.637	-.0025318	.0015529
lier	.0415166	.0572379	0.73	0.469	-.0715016	.1545348
tltdr	.0146848	.0107075	1.37	0.172	-.0064576	.0358271
tltar	-.1300494	.0535289	-2.43	0.016	-.235744	-.0243548
_cons	.1030979	.0251882	4.09	0.000	.053363	.1528328
rho	.6179538					

Durbin-Watson statistic (original) 0.905841
Durbin-Watson statistic (transformed) 2.182656

Source: Author's STATA 14.2 Outputs, 2023

Interpretation of the Panel Least Squares Regressions

As depicted above, P-value = 0.1109, F (5, 164) = 1.82 gives the inference that the cumulative influence of the exogenous variables is statistically insignificant albeit positive. Further, adjusted R-squared indicated that only 2.38% of changes in the regressed (ROCE) are affected by these predictors. That is, all the entered explanatory variables collectively exerted statistically nonsignificant effect on return on capital employed of these financial firms excluding the total loan to total asset ratio. The regression equation for the all-inclusive model is given by

roce = 0.1031+0.0068litlr –0.1301tltar

In table 4.11, the transformed Durbin-Watson d-statistics is perfect 2(from 0.90 to 2.18) indicating that any serial correlation has been corrected. F-Statistic (a powerful statistic for testing hypothesis) depicts that the combined influence of all the explanatory variables on return on capital employed of companies is very weak (insignificant). In other words, the entered explanatory variables exerted weak effect on return on capital employed of financial services companies studied.

The multiple coefficients of determination-squared, is 5.3% indicating that 5.3% changes or variation on return on capital employed of these companies is caused by the independent variables (determinants) while 94.7% is caused by other factors. Further, 5.3% is not a significant influence with respect to panel data. The P-value

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is insignificant at 0.1109, which is higher than 5% (P =0.1109> 0.05). Specifically, only one of the explanatory variables (Total Loan to Total Assets Ratio) exerted strong influence on return on capital employed. In practical terms, a unit increase in Loan Impairment to Total Loan Ratio, significantly increased return on capital employed of firms by 0.007 units, 0.042 units and 0.015 units respectively. Conversely, Total Loan to Total Assets Ratio increased return on capital employed of these companies by -0.0005 units and -0.1301 units respectively. Their relevance / insignificance influence on the regress and is deducible from their P-values (Loan Impairment to Total Loan Ratio at P = 0.786 > 0.05, and *Total Loan to Total Assets Ratio at P=0.016*<0.05*).

4.3 Test of Hypotheses

Hypothesis One

Step 1: Restatement of the Hypothesis in Null and Alternate Forms

H_0: Loan impairment to total loan ratio has no significant effect on ROCE of listed financial services firms in Nigeria.

Step 2: Statement of Decision Criteria

Gujarati and Porter (2014) assert that decision rule involves accepting the alternate hypothesis (H_1) if the sign of the coefficient for Loan impairment to total loan ratio is either positive or negative, the modulus of the t-statistic >|2.0| and the p-value of the t-statistic < 0.05. Otherwise, accept H_0 and reject H_1.

Step 3: Presentation of Test Results

Table 4.11 Prais-Winsten AR (1) Regression iterated estimates adjusted for Durbin-Watson statistics are used to test the above-stated hypothesis.

Step 4: Decision

The coefficient of regression is 0.0067585litlr which indicates that loan impairment to total loan ratio has a positive relationship with the return on capital employed of listed financial services firms in Nigeria. As regards beta (β) coefficient, table 4.11 indicates that a unit increase in Loan impairment to total loan ratio (litlr) will lead to about 0.007 unit increase on return on capital employed of listed financial services firms in Nigeria and vice versa. This provided the answer to research question one that loan impairment to total loan ratio has about 0.7% positive effect on the corporate performance of listed financial services firms in Nigeria.

To test the null hypothesis, since the t-statistics is 0.27 which is < 2.00 and p-value of 0.786 which is > 0.05 level of significance, we cannot reject the null hypothesis that loan impairment to total loan ratio (litlr) has no significant effect on return on capital employed of listed financial services firms in Nigeria. We therefore conclude that loan impairment to total loan ratio (litlr) has non-significant positive effect on return on capital employed of listed financial services firms in Nigeria

Hypothesis Two

Ho: Total loan to total assets ratio has no significant effect on return on capital employed of listed financial service firms in Nigeria.

Step 2: Statement of Decision Criteria

According to Gujarati and Porter (2014), decision rule involves accepting the alternate

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hypothesis (H_1) if the sign of the coefficient for total loan to total assets ratio is either positive or negative, the modulus of the t-statistic > 2.0 and the p-value of the t-statistic < 0.05. Otherwise, accept H_0 and reject H_1.

Step 3: Presentation of Test Results

Table 4.11 Prais-Winsten AR (1) Regression iterated estimates adjusted for Durbin-Watson statistics is used to test the above stated hypothesis.

Step 4: Decision

The coefficient of regression is -0.1300494tltar which showed a negative relationship between total loan to total assets ratio and return on capital employed of listed financial services firms in Nigeria. This implies that a unit increase in total loan to total assets ratio will result to about 0.130 units decrease in return on capital employed and vice versa. In answer to research question five, the study posits that total loan to total assets ratio had about 13% significant negative effect on return on capital employed of listed financial services firms in Nigeria.

To test null hypothesis the t-statistics is -2.43 which greater than 2.00 and the p-value is 0.016 which is less than 0.05 level of significance. Since p-value is <0.05 at 0.0.016 and t-statistics is > 2 at -2.42 the study could not accept the null hypothesis that total loan to total assets ratio had no significant effect on return on capital employed of listed financial services firms in Nigeria. The study therefore accepted alternative hypothesis that total loan to total assets ratio exerted strong negative effect on return on capital employed of listed financial services firms in Nigeria. We therefore conclude that total loan to total to total assets ratio had 13% significant negative effect on return on capital employed of listed financial services firms in Nigeria.

The study on credit risk management and its effect on corporate performance of listed financial services firms in Nigeria was carried out considering the several incidences of bank failures resulting from majorly bad credit risk management and the fact that financial services firms had been declaring huge profits amidst rising non-performing loans in financial services firms in Nigeria. A cursory look at the results of the analysis indicated that a unit change in loan impairment to total loan ratio insignificantly increases return on capital employed (ROCE) by 0.01 units. This finding depicted a nonsignificant positive relationship between loan impairment to total loan ratio and return on capital employed P>|t| = 0.786 > 0.05, t-statistic <|2| at 0.27 of listed financial service firms in Nigeria. Glancing at hypothesis two, the outcome indicates that total loans to total assets ratio exerted significant negative relationship with return on capital employed of listed financial service firms in Nigeria given that P>|t| = 0.016< 0.05, t-statistic > |2| at -2.43.

5 Conclusion

Sustainable credit risk management is pivotal in ensuring financial stability within Nigeria's financial services sector. The findings indicate that while the **loan impairment to total loan ratio** demonstrates a nonsignificant positive relationship with the **return on capital employed (ROCE)**, suggesting that impaired

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loans do not significantly enhance profitability, their presence does not detrimentally impact capital efficiency either. This could imply effective risk mitigation strategies that minimize the adverse effects of impaired loans.

Conversely, the **total loan to total assets ratio** has a significant negative relationship with ROCE, highlighting that an overextension of credit relative to assets may erode profitability. This underlines the importance of maintaining a balanced credit portfolio to safeguard financial stability and ensure optimal capital utilization.

These insights emphasize the need for financial institutions in Nigeria to adopt prudent credit risk management strategies that focus on minimizing loan impairments and carefully managing the allocation of assets to loans. By striking this balance, the sector can achieve both profitability and long-term sustainability, contributing to the broader financial stability of Nigeria's economy. The study concluded that Sustainable Credit Risk Management has significant not positive Influence on Financial Stability in Nigeria's Financial Services Sector.

Recommendation

To foster sustainable credit risk management and enhance financial stability in Nigeria's financial services sector, the following recommendations are proposed based on the identified relationships:

i. Although the loan impairment to total loan ratio has a nonsignificant positive relationship with the return on capital employed (ROCE), financial institutions should continue to enhance credit risk monitoring frameworks to reduce the occurrence of impaired loans. This can be achieved through robust credit appraisal systems, early-warning mechanisms, and proactive recovery processes to minimize potential losses.

ii. Given the significant negative relationship between the total loan-to-total assets ratio and ROCE, banks should adopt a balanced approach to asset allocation. Limiting over-reliance on loans as a proportion of total assets is crucial. Financial institutions should diversify their investment portfolios to include safer, income-generating assets that do not disproportionately strain their capital base.

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