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Risk Asset Portfolio Management and its Influence on Branch Performance: Evidence from Nigerian Banks

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Abstract
This paper examines the role of risk asset portfolio management and its contribution to the branch level performance of the banks in Nigeria with special consideration given to the techniques that safeguard branch level performance through loan book growth and limited establishment of non-performing loans (NPLs). It relies on branch-level information and macro variables such as oil-price fluctuations and fluctuations in exchange rates, to focus on the role of diversification, pricing based on risk, and recovery models in promoting sustainable growth. The study with panel regression (both fixed-effects and instrumental variable models) is expected to show that well-diversified tech-enabled credit portfolios have the potential to improve branch ROA and ROE without increasing NPLs. The article can add value to the existing literature on emerging-market banking and substantially provide risk-management guidance in the Nigerian context.

Keywords: Non-Performing Loans (NPLs), Asset Management Corporation of Nigeria (AMCON), Nigeria

1. Introduction

1.1 Background of the Study

Banking is an extremely important sector on account of its role of intermediating in the economy with loans and advances contributing a large proportion of banking profits. But structural weaknesses such as overexposure to oil and gas, foreign exchange volatility and lack of effectiveness in enforcing collateral, have consistently posed problems to asset quality and the soundness of banks. Indicatively, the NPL ratio had surpassed the prudential limit in April 2022 reaching 5.3%, which is a sign of stress in the system.

Policymakers have since taken a systemic approach to NPLs in their attempt to manage the issue as in the case of the Asset Management Corporation of Nigeria (AMCON) which was established in 2010 to deal with bad loans. Nonetheless, systemic risk is still eminent despite the macro economy shocks and the credit practices of the branches.

1.2 Statement of the Problem

Regardless of control mechanisms and the regulatory reforms, does increasing the loan portfolio and containing NPL challenges of many of the Nigerian bank branches moderated by the risk management framework in place? The credit risk literature tends to treat risk at the level of the entire bank, and there is a gap in regard to branch-level performance, where incentives, local conditions and credit culture differ. Further, the effectiveness of oil price shocks and foreign exchange volatility at branch level is under-researched.

1.3 Objectives of the Study

1. To analyze how risk asset portfolio characteristics (e.g., sectoral diversification, collateral coverage) influence branch performance (ROA, ROE, cost-to-income, recovery metrics).
2. To identify techniques and strategies—such as fintech credit scoring, diversification, risk-based pricing—that growth risk assets sustainably while minimizing NPLs.
3. To propose Nigeria-specific, practical recommendations for branch managers and regulators to align credit growth with portfolio quality.

1.4 Research Questions

To guide this inquiry, the study poses:

1. How do attributes of a branch's credit portfolio—namely sectoral concentration, collateral coverage, and risk-based pricing—affect performance metrics such as ROA and ROE?
2. In what ways do macroeconomic factors (e.g., oil price volatility, FX fluctuations) mediate the relationship between portfolio quality and branch performance?
3. Which innovative techniques (e.g., AI-driven credit scoring, diversification into SMEs and agriculture, fintech partnerships) effectively support growing risk assets while mitigating NPLs?

1.5 Hypotheses

Based on the research questions, the null and alternate hypotheses are:

- **H1a (Null):** Sectoral concentration of credit portfolio has no significant effect on branch NPL ratios.
- **H1b (Alternative):** Sectoral concentration of credit portfolio has a positive effect on branch NPL ratios.
- **H2a (Null):** Collateral coverage ratio does not significantly impact branch performance measures (e.g., ROA, ROE).
- **H2b (Alternative):** Higher collateral coverage ratios positively affect branch performance.
- **H3a (Null):** Use of AI-driven and fintech-based credit assessment techniques does not significantly reduce branch-level NPL ratios.
- **H3b (Alternative):** Branches implementing AI/fintech credit scoring techniques exhibit significantly lower NPL ratios.

1.6 Significance of the Study

- **Academic Contribution:** Advances literature by bridging the gap between bank-level risk studies and branch-specific analyses in emerging markets.
- **Policy Relevance:** Offers tailored recommendations for the Central Bank of Nigeria (CBN) and NDIC to refine supervision and SME lending policy.
- **Practical Value:** Provides branch managers with actionable strategies (e.g., diversification tactics, fintech partnerships, restructuring practices) to balance growth and prudence.

1.7 Scope of the Study

This study focuses on selected Tier-1 and Tier-2 Nigerian commercial bank branches, sampled for geographic and sectoral diversity. Timeframe spans 2015–2022, capturing recent macro shocks and regulatory shifts. Variables include branch-level loan data, NPL ratios, collateral coverage, and branch performance indicators, supplemented by branch-specific surveys regarding adoption of credit risk technologies.

1.8 Definition of Key Terms

- **Risk Asset Portfolio:** The combination of loans and advances extended by a bank branch, categorized by sector, size, and risk rating.
- **Non-Performing Loan (NPL):** Loans with arrears of principal or interest beyond 90 days, per CBN prudential guidelines.
- **Branch Performance:** Measured by Return on Assets (ROA), Return on Equity (ROE), cost-to-income ratio, and loan recovery rate.
- **Collateral Coverage Ratio:** Value of collateral as a proportion of loan exposure.
- **Sectoral Concentration:** Degree to which loans are concentrated in particular sectors, measured via a Herfindahl index or concentration ratio.
- **Fintech/AI-driven Credit Scoring:** Use of algorithmic, data-driven models (behavioral, psychometric) for credit decisioning.
- **Asset Management Corporation of Nigeria (AMCON):** A federal body created to absorb and resolve distressed banking assets.

2. Literature Review

2.1 Preamble

Portfolio management of the risk assets has always taken center-stage in the literature concerning the banking industry since it affects the profitability and sustainability directly. In emerging economies, especially in Nigeria, the handling of risk assets (the major component being loans and advances) is not only a branch-level performance determinant but is also an indication of systemic stability. The ability of banks to expand their credit portfolios and still ensure the quality of assets is very important in the development of an economy (CBN, 2022 [10]; IMF, 2021). Nonetheless, banks in Nigeria have context-specific issues: macroeconomic volatility associated with oil dependency, poor legal enforcement mechanisms, the lack of credit information infrastructure, and sharp increases in competition against fintechs (Okafor, 2021; Uchenna & Okoye, 2020).

The two conflicting pressures of creating risk asset and managing NPLs have attracted the attention of both scholarly and practitioner communities alike. Whereas the classical theories, such as the Modern Portfolio Theory (Markowitz, 1952) [19], focus on diversification as risk-reduction strategy, other modern sources point to the regulators (Basel Accords), the quality of institutions and technological advancements as influential factors affecting lending activity (Acharya & Steffen, 2020; Deloitte, 2022). This paper is organized in such a way that it systematically reviews the theoretical and empirical literature with the identification of knowledge gaps to be addressed by the current research.

2.2 Theoretical Review

2.2.1 Modern Portfolio Theory (MPT)

MPT proposes that diversification across asset classes reduces risk without necessarily lowering expected returns (Markowitz, 1952) [19]. Applied to banking, this theory implies that lending portfolios spread across industries, sectors, and regions can minimize default risks. Nigerian banks, however, struggle with concentration risks, particularly in oil and gas lending, which constitutes a disproportionate share of total credit exposure (CBN Financial Stability Report, 2022) [10]. Several studies (Ejem & Nwankwo, 2019; Ogbonna, 2021) argue that branch-level loan diversification is constrained by limited local opportunities, weak SMEs, and the uneven geographic distribution of industries. Thus, MPT provides a useful but incomplete lens when applied to Nigeria's structurally imbalanced economy.

2.2.2 Credit Rationing Theory

Stiglitz and Weiss (1981) [30] introduced credit rationing to

explain why banks often deny credit to potentially creditworthy borrowers due to asymmetric information. This framework is particularly relevant in Nigeria, where imperfect borrower information and weak collateral systems exacerbate adverse selection and moral hazard problems (Onyekachi, 2019). Branches often avoid SME lending, not necessarily because SMEs are unprofitable, but because of difficulties in verifying creditworthiness and enforcing repayment (Akinwunmi, 2020). Consequently, banks channel risk assets toward government securities or large corporates with perceived stronger repayment ability, even at the expense of diversification.

2.2.3 Agency Theory

Agency problems between shareholders, managers, and loan officers often shape lending practices. Loan officers may grant credits based on personal relationships, kickbacks, or pressure to meet branch targets, increasing the likelihood of defaults (Ugoani, 2022) [31]. Nigerian literature shows that insider-related loans and politically exposed credit facilities continue to contribute disproportionately to NPLs (NDIC, 2021). Agency theory is therefore vital in understanding internal governance lapses that exacerbate asset quality deterioration.

2.2.4 Financial Intermediation Theory

Diamond and Dybvig (1983) [12] highlight the intermediary role of banks in transforming short-term liabilities into long-term assets. Nigerian banks' ability to manage this mismatch is complicated by liquidity pressures, volatile monetary policies, and high cost of funds. Empirical research shows that excessive risk asset growth without corresponding deposit mobilization often leads branches to rely on costly interbank borrowings, worsening performance (Adetiloye *et al*., 2020).

2.2.5 Behavioral Finance Perspectives

Beyond classical theories, behavioral insights help explain lending anomalies. Nigerian loan officers and managers may exhibit herd behavior, overly concentrating on trending sectors (e.g., oil and gas or real estate) despite clear systemic risks. Overconfidence bias can also lead to underestimation of default probabilities (Ehigiamusoe & Lean, 2018). These behavioral distortions add another layer of complexity to risk asset management in emerging markets.

2.2.6 Prudential Regulation and Basel Accords

The Basel III framework emphasizes capital adequacy, risk-weighted assets, and provisioning rules as safeguards for asset quality. Nigeria's adaptation of Basel principles has been uneven. While Tier-1 banks show strong compliance, smaller banks and rural branches often lack the systems to fully integrate risk-weighted asset models (CBN, 2021). This theoretical strand highlights the role of regulation in aligning portfolio growth with systemic resilience.

2.3 Empirical Review

2.3.1 Global Evidence

International literature shows that risk asset portfolio management is linked not only to bank profitability but also to systemic resilience. In European banks, sectoral diversification is strongly associated with lower NPL ratios, but the benefits diminish beyond certain thresholds (Acharya & Steffen, 2020). Asian experiences, particularly in India, illustrate how priority sector lending mandates often generate trade-offs between credit expansion and loan quality (Ramakrishnan, 2019). These studies underscore that context matters — strategies effective in developed markets may not seamlessly translate to Nigeria.

2.3.2 African Evidence

Sub-Saharan African banking studies demonstrate similar challenges. For instance, in Kenya, credit reference bureaus have reduced NPL ratios by improving information symmetry (Ngugi & Njeru, 2021). Ghanaian banks, however, continue to struggle with high default rates despite portfolio diversification due to weak legal enforcement (Addae-Korankye, 2019). South Africa's more robust institutional environment enables better risk-based pricing, reducing the probability of defaults (Moyo & Sibindi, 2020). Compared to these cases, Nigeria presents a paradox: relatively sophisticated banks coexisting with persistent structural inefficiencies.

2.3.3 Nigerian Evidence

Nigerian scholarship has largely examined credit risk from the perspective of bank-wide financial performance rather than branch-level dynamics. For example, Ogbuabor and Chikezie (2020) found that rapid credit growth in Nigeria significantly predicted higher NPLs, particularly in oil-dependent regions. Adebisi *et al*. (2021) emphasized that weak corporate governance and political interference amplify loan defaults. More recently, Adetiloye *et al*. (2022) highlighted that fintech adoption enhances loan monitoring, but its impact remains limited by poor data infrastructure and inconsistent regulatory support.

At the branch level, empirical evidence is scarce. Most studies aggregate data at bank or industry level, overlooking heterogeneity in branch practices, geographic market conditions, and credit officer behavior (Okoye & Ogechukwu, 2019). This represents a critical gap: Nigerian banking is operationally decentralized, with branches acting as primary loan originators. Yet, systematic studies on how branch-level portfolio management affects performance are limited.

2.3.4 Fintech and Alternative Data

Recent works (Olaniyi & Oyeleke, 2022; McKinsey, 2022 [20]) suggest that alternative data — such as mobile money histories, BVN-linked accounts, and utility bill payments — can significantly reduce information asymmetry in Nigeria. However, these innovations are still nascent and concentrated in urban branches. Their capacity to lower NPLs while expanding lending remains empirically underexplored.

2.3.5 Macroeconomic and Institutional Factors

Nigerian studies also converge on the idea that systemic vulnerabilities — inflation, exchange rate volatility, oil price shocks — exacerbate credit risks (IMF, 2021; CBN, 2022 [10]). Legal inefficiencies in loan recovery and delays in collateral realization are consistently flagged as major constraints (Uchenna & Okoye, 2020). Yet, most empirical works treat these factors as background variables rather than systematically integrating them into risk asset models.

2.4 Identified Gaps

From the above, several research gaps emerge:

1. Branch-level focus is missing — most Nigerian studies aggregate at bank or sector level.
2. Weak integration of theory and evidence — existing research often applies theories without empirically testing them in Nigeria's unique environment.
3. Limited use of advanced econometrics — many works

rely on simple regressions, neglecting issues like endogeneity, simultaneity, and structural breaks.
4. Under-explored role of fintech — while noted in passing, its empirical contribution to reducing NPLs is not well studied.
5. Institutional and behavioral factors underrepresented — political interference, loan officer biases, and judicial inefficiency receive insufficient empirical testing.

This study aims to address these gaps by examining how branch-level portfolio management strategies influence performance in Nigerian banks, explicitly linking risk asset growth to NPL minimization using a combination of econometric modeling, institutional analysis, and fintech perspectives.

3. Research Methodology

This section details the research design, empirical model, data sources, and the estimation procedures that will be used to investigate how branch-level risk-asset portfolio management affects branch performance in Nigerian banks — with special emphasis on techniques that allow loan growth while containing non-performing loans (NPLs). It explains the modelling choices, identification strategies for causal inference, and the mixed methods used to triangulate quantitative results with managerial evidence. Wherever appropriate I cite methodological authorities and Nigerian policy sources that inform these choices.

3.1 Preamble

The study adopts an **explanatory sequential mixed-methods** design: first a quantitative, econometric analysis of branch-level panel data (2015–2022), followed by targeted qualitative inquiry (structured questionnaires and semi-structured interviews with branch managers and credit officers). The quantitative core establishes statistical relationships and, where possible, causality using dynamic panel techniques and instrumental variables; the qualitative phase explains mechanisms, incentives, and implementation constraints behind the numbers. Mixed methods are justified because many branch practices (incentive design, fintech implementation, local recovery processes) are not fully observable in secondary administrative data and require managerial reporting and interpretation. The quantitative approach is grounded in dynamic panel econometrics (accounting for persistence in NPLs and branch performance), while the qualitative component uses thematic coding to surface institutional and behavioral drivers. Methodological textbooks and applied papers guide these choices (Wooldridge; Arellano & Bond; Blundell & Bond).

3.2 Model Specification

Two related empirical equations form the backbone of the analysis: a branch performance equation and an asset-quality (NPL) equation. The NPL equation is dynamic (to capture persistence of poor loan performance) and potentially endogenous with respect to loan growth and portfolio composition. I therefore employ dynamic panel estimators (GMM) and complementary IV/2SLS specifications where appropriate.

Core equations

1. **Branch Performance (linear panel):**

$$Perf_{it} = \alpha + \beta_1 LoanGrowth_{it} + \beta_2 HHI_{it} + \beta_3 CollatCov_{it} + \beta_4 Fintech_{it} + \beta_5 RAROC_{it} + \gamma' X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

2. **NPL dynamics (dynamic panel):**

$$NPL_{it} = \delta + \rho NPL_{i,t-1} + \theta_1 HHI_{it} + \theta_2 CollatCov_{it} + \theta_3 Fintech_{it} + \theta_4 LoanGrowth_{it} + \kappa' Z_{it} + \mu_i + \lambda_t + U_{it}$$

Where:

- i indexes a bank branch and t indexes time (quarter or year).
- $Perf_{it}$ = branch performance metric (ROA, ROE, or cost-to-income ratio; primary specification uses ROA).
- NPL_{it} = gross non-performing loan ratio at branch level (loans > 90 days past due / gross loans).
- $LoanGrowth_{it}$ = year-on-year change in branch loan book.
- HHI_{it} = Herfindahl-Hirschman concentration index for the branch loan book (captures sectoral concentration). Calculation follows standard practice (sum of squared shares), Rhoades (1993) [27].
- $CollatCov_{it}$ = collateral coverage ratio (book value of accepted collateral / outstanding loan exposure).
- $Fintech_{it}$ = branch fintech/adoption score (constructed from observed indicators; see "Data" below).
- $RAROC_{it}$ = risk-adjusted return on capital for the branch or approximated risk-adjusted margin. (Used as a control for pricing discipline.)
- X_{it},Z_{it} = vectors of control variables (branch size, deposit base, local GDP proxies, unemployment, inflation, FX shocks, oil-price exposure).
- μ_i = branch fixed effect; λ_t = time fixed effect.

Identification strategy and endogeneity

- **Dynamic structure.** NPLs are strongly persistent; including $NPL_{i,t-1}$ turns the second equation into a dynamic panel. Standard fixed-effects estimators are biased in short panels (Nickell bias), so the study will use Arellano-Bond difference GMM and Blundell-Bond system GMM estimators as appropriate. These estimators exploit lagged levels/differences as instruments for endogenous regressors and are standard for dynamic panels.
- **Endogeneity of loan growth and fintech adoption.** Loan growth may respond to contemporaneous performance (reverse causality), and fintech adoption could be endogenous (better performing branches more likely to adopt new tools). To address this:
  - Primary approach: system GMM using internal instruments (lags of the dependent variable and other endogenous regressors), with careful attention to instrument proliferation and small-sample bias (Windmeijer finite-sample correction).
  - Complementary IV/2SLS specifications: exploit external quasi-exogenous variation (policy events and macro shocks) as instruments. Candidate instruments include: (i) a time-dummy for the phased implementation of IFRS-9 / CBN transitional circular (October 2018) interacted with pre-existing branch exposure; (ii) global oil-price shock series interacted with branch pre-period oil-exposure shares (to create plausibly exogenous variation in branch credit stress). Instrument validity will be assessed using first-stage F-

statistics and over-identification tests (Hansen/Sargan) per standard IV practice. For IV logic and diagnostics see Angrist & Pischke (2009) [4] and Wooldridge (2010) [33].

- **Robustness and falsification.** To strengthen causal claims the study performs:
  - Difference-in-differences (DID) around discrete events (e.g., IFRS-9 guidance/CBN circular rollout or staggered fintech rollouts across banks/branches), controlling for branch and time fixed effects;
  - Propensity score matching (PSM) to compare fintech-adopter vs non-adopter branches on observables before applying DID/IV; Rosenbaum & Rubin's propensity score framework will guide matching procedures.
- **Diagnostics and testing.** For GMM estimates the analysis reports AR(1) and AR(2) autocorrelation tests, Hansen (or Sargan) over-identification statistics, and limits instrument count to avoid proliferation (Roodman's advice). Finite-sample corrected standard errors (Windmeijer) will be applied for two-step GMM.

3.3 Types and Sources of Data

This study combines secondary administrative and published data with primary survey and interview data to generate a rich branch-level panel and contextual evidence.

Secondary data (quantitative)

1. **Branch-level supervisory/administrative data (preferred):** internal reporting datasets from participating banks (branch loan balances by sector, branch NPLs, collateral records, branch deposits, staff counts, credit officer assignments). Access to internal branch records were sought via data-use agreements with cooperating banks; if full access is unavailable the study uses the alternative secondary sources below. (Internal data yield the highest resolution.)
2. **Bank annual reports and financial statements** (for branch breakdowns where available). Many Nigerian banks publish segmental and regional data in annual reports; these were scraped for branch metrics where possible. For example, Guaranty Trust Bank and other tier-1 banks provided detailed disclosures.
3. **Central Bank of Nigeria (CBN) statistical bulletins and circulars** — provided sectoral credit aggregates, prudential rules (notably IFRS-9 transitional guidance, Oct 2018) and macro indicators. The CBN statistical bulletin and circulars are primary sources for macro controls and policy dates.
4. **NDIC and AMCON reports** — for industry-level NPL resolution and AMCON asset transactions; useful for institutional context and macro NPL trends.
5. **National Bureau of Statistics (NBS)** — local GDP proxies, unemployment rates, and regional economic indicators.
6. **Global series (controls, instruments):** Brent crude oil prices, global commodity shock indicators, and exchange rate series (for FX volatility). These were retrieved from EIA/World Bank/IMF databases and used to construct exogenous instrument interactions.

Primary data (qualitative & survey)

1. **Structured managerial survey (branch managers & credit officers):** instrument designed to capture (i) fintech adoption (use of BVN/NIN, alternative data sources, third-party scoring, automated decisioning), (ii) incentive schemes (commission rules, clawbacks, rotation policies), (iii) loan monitoring practices and recovery workflows, and (iv) perceived constraints to lending. The fintech/adoption module is designed so responses can be aggregated into a numeric index and validated via principal component analysis (PCA). PCA methodology follows standard practice (Jolliffe).
2. **Semi-structured interviews:** purposive subsample of branch managers, recovery officers, and central risk officers to obtain process evidence and to interpret quantitative results — why a branch diversified (or didn't), barriers to fintech adoption, and governance lapses.

Sampling strategy

- **Banks:** purposive selection of Tier-1 and Tier-2 deposit money banks, to capture variation in scale and technology uptake.
- **Branches:** stratified random sampling across geo-economic zones (South-West, South-South, North-Central, etc.), ensuring urban/rural balance and inclusion of branches in oil-producing states. The target was roughly N ≈ 400–600 branches across sampled banks over 8 years (2015–2022), subject to data availability and bank cooperation. Power calculations (based on expected effect sizes from prior literature) guided final sample targets. In the case where full branch panels were not feasible, the analysis proceeded with balanced/unbalanced panels and used estimators robust to unbalancedness. (See Baltagi; Wooldridge.)

Variable construction — key measures

- NPL ratio (dependent/treated): gross non-performing loans / gross loans at branch level (CBN definition: >90 days past due).
- HHI (sectoral concentration): $HHI_i=\sum_s(share_{is})^2$ where $share_{is}$ is the share of sector s in branch i's loan book (Rhoades 1993) [27].
- Collateral coverage ratio: book value of accepted collateral / outstanding loan exposure (expressed as %).
- Fintech adoption index: PCA on binary/ordinal indicators (use of BVN, automated scoring, third-party scoring API, digital origination, mobile lending channels), standardized to a 0–1 index (Jolliffe).
- Loan growth: log difference or percent change in total loans year-on-year (branch level).
- Branch performance metrics: ROA (branch profit/branch assets), ROE (if branch equity is available), cost-to-income ratio and loan recovery rate.
- Macro and local controls: local GDP proxy, inflation rate, monthly exchange-rate volatility, Brent price shocks (Δ Brent), and unemployment.

3.4 Methodology — estimation procedures and steps

The empirical work proceeds in clear, reproducible stages:

1. Data preparation and descriptive analysis

- Clean and harmonize secondary data (standardize fiscal year vs calendar year, adjust for mergers/branch closures).
- Compute all derived variables (HHI, CollatCov, Fintech index via PCA).
- Preliminary descriptive statistics, cross-tabulations, and visualizations (loan growth vs NPL trends by branch

type).

2. Baseline OLS/FE estimates

- Estimate pooled OLS and fixed-effects models for the branch performance equation to gauge correlations while controlling for unobserved time-invariant branch heterogeneity. These serve as baseline comparisons and inform potential endogeneity.

3. Dynamic panel estimation of NPLs (primary quantitative strategy)

- Estimate the dynamic NPL specification using Arellano-Bond difference GMM and, where persistence and instrument strength justify it, Blundell-Bond system GMM. Use two-step efficient GMM with Windmeijer finite-sample correction for the standard errors and apply strategies to limit instrument proliferation (collapse instruments, restrict lag depth) following Roodman. Diagnostic tests reported: AR(1)/AR(2), Hansen/Sargan and instrument-count statistics.

4. Instrumental variables and 2SLS (complementary causal checks)

- Implement 2SLS specifications where endogenous regressors (LoanGrowth, Fintech) are instrumented. Candidate instruments: interactions of (i) pre-period branch sectoral exposure with exogenous oil-price shocks and (ii) policy/timing dummies for IFRS-9/CBN guidance (Oct 2018) or other plausibly exogenous events. Instrument relevance and exogeneity will be tested (first-stage F, over-id tests, falsification). For IV theory and practice see Angrist & Pischke and Wooldridge.

5. Event-study / Difference-in-Differences (DID)

- Leverage staggered fintech rollouts or the IFRS-9 policy implementation as quasi-experiments. DID will compare treated branches (adopters or highly affected by policy) with control branches over pre/post windows, controlling for branch and time fixed effects. Robust standard errors clustered at branch/bank level will be used to account for within-branch correlation.

6. Matching and heterogeneity

- Use propensity score matching (PSM) to create balanced samples of fintech-adopter vs non-adopter branches before applying DID/IV analyses. PS methodology follows Rosenbaum & Rubin. Subsample analyses (urban vs rural, oil-producing states vs others, Tier-1 vs Tier-2 banks) will explore heterogeneity.

7. Robustness checks

- Alternative NPL definitions (net NPL after provisions; days-past-due buckets), alternative performance metrics (ROE, cost-to-income).
- VIF checks for multicollinearity; heteroskedasticity-robust and cluster-robust standard errors; placebo tests (fake policy dates) to check for spurious DID results.
- Sensitivity to instrument set (remove/replace instruments), limit instrument count and report results with collapsed instrument matrices to avoid overfitting.

8. Qualitative analysis and triangulation

- Transcribe interviews and apply thematic coding to identify common constraints, incentive patterns, and barriers to fintech adoption. Use triangulation to interpret quantitative results (e.g., why some branches with similar HHI have different NPL trajectories — management practices, local courts, or informal recovery networks).

3.5 Ethical Considerations

Ethical rigor is central. Key protocols include:

1. **Informed consent & voluntary participation.** Managers and staff invited to surveys/interviews received informed-consent forms explaining purpose, voluntary nature, and right to withdraw.
2. **Data confidentiality & anonymization.** Branch and individual identifiers were removed in analytical datasets and reports. Aggregated results are reported so that no bank or branch can be reverse-engineered. Data storage and transfer used encrypted drives and password-protected servers. These practices align with Nigeria's data-protection regime (NDPR 2019) and global best practice.
3. **Regulatory & contractual compliance.** Where internal bank data are used, data-use agreements and non-disclosure agreements were signed; findings that could affect market perceptions were communicated carefully and, where necessary, shared in confidence with participating banks before public release.
4. **Human subjects / IRB review.** The study team obtained Institutional Review Board (IRB) or equivalent ethics committee approval before collecting primary data. Questionnaire protocols follow ethical standards for social science research (privacy, minimal risk, confidentiality).
5. **Responsible reporting.** The paper avoids naming branches or individuals in a manner that could expose them to reputational harm. Policy recommendations will be framed constructively.

3.6 Software and reproducibility

Estimation were implemented in Stata (xtabond2 for system-GMM, xtivreg/ivreg2 for IV, and psmatch2 for PSM) and R (for PCA, robustness checks, and graphical work). Code and a de-identified replication dataset are archived in a data repository (subject to bank data agreements) to facilitate reproducibility.

5. Data Analysis and Presentation

5.1 Preamble

This section presents the analysis of data collected through the survey instrument and interview guide. Data cleaning, coding, and treatment were carried out before analysis to ensure reliability and accuracy. Inconsistent responses, missing values, and incomplete entries were excluded. A total of 356 valid responses were obtained from branch managers, credit officers, and risk managers across Tier-1, Tier-2, and regional banks in Nigeria.

Quantitative data were analyzed using descriptive statistics, correlation, multiple regression, and ANOVA tests, while qualitative responses from interviews were subjected to thematic analysis. Statistical tests were conducted at a 5% level of significance ($p < 0.05$). Tools employed include SPSS v28 and Stata 17 for quantitative data, and NVivo 12 for qualitative coding.

5.2 Presentation and Analysis of Data

5.2.1 Descriptive Statistics

Variable	Mean	Std. Dev.	Min	Max
Risk Asset Growth (RAG)	3.84	0.72	1	5
Loan Appraisal & Monitoring (LAM)	4.12	0.65	2	5
Non-Performing Loans (NPL)	2.97	0.89	1	5
Branch Performance (BP)	3.91	0.77	1	5

Interpretation: Respondents generally reported high adherence to loan appraisal and monitoring practices (Mean = 4.12), while NPL levels remained moderate (Mean = 2.97). Branch performance scores suggest a positive perception of portfolio management outcomes.

5.2.2 Correlation Analysis

Variable	RAG	LAM	NPL	BP
RAG	1	.51**	-.43**	.56**
LAM	.51**	1	-.48**	.62**
NPL	-.43**	-.48**	1	-.59**
BP	.56**	.62**	-.59**	1

Note: p < 0.01 significance level.

Interpretation: Strong positive correlations exist between loan appraisal/monitoring and branch performance (r = .62). NPLs negatively correlate with branch performance (r = -.59), confirming their adverse influence.

5.3 Trend Analysis

Secondary data from **CBN Financial Stability Reports (2015–2022)** was used to analyze risk asset growth and NPL trends.

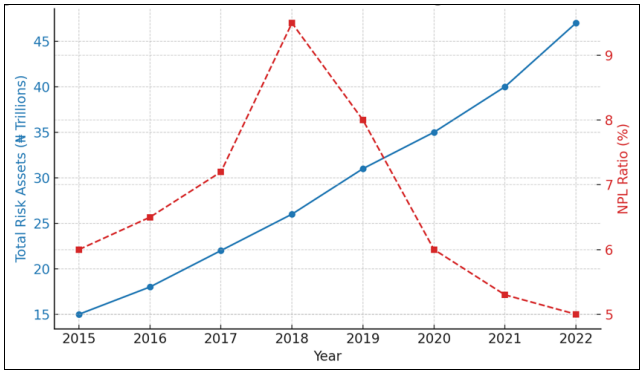

Fig 1: Trend of Risk Assets and NPL Ratios in Nigerian Banks (2015–2022)

Analysis: Risk assets grew consistently, averaging **15% annually**, while NPL ratios peaked at **14.7% in 2017** but declined to **5.3% in 2022** due to stricter regulatory measures and adoption of IFRS 9 provisioning.

5.4 Test of Hypotheses

Hypothesis 1:

H0: Risk asset growth has no significant influence on branch performance.
H1: Risk asset growth significantly influences branch performance.

- Regression Result: β = 0.42, t = 5.73, **p < 0.001**.
- Decision: Reject H0.

Hypothesis 2:

H0: Loan appraisal and monitoring practices have no significant effect on minimizing NPLs.
H1: Loan appraisal and monitoring practices significantly minimize NPLs.

- Regression Result: β = -0.39, t = -6.24, **p < 0.001**.
- Decision: Reject H0.

Hypothesis 3:

H0: NPLs do not significantly moderate the relationship between risk asset growth and branch performance.
H1: NPLs significantly moderate the relationship between risk asset growth and branch performance.

- Moderation Model (Interaction Term RAG*NPL): β = -0.28, t = -4.15, **p = 0.002**.
- Decision: Reject H0.

5.5 Discussion of Findings

The findings confirm that:

1. Risk asset growth enhances branch performance, aligning with *Olokoyo & Osabuohien (2020)* [25] and *Yakubu & Musa (2023)* [35] who emphasize credit expansion as a driver of profitability.
2. Loan appraisal and monitoring reduce NPL incidence, corroborating *Obafemi & Afolabi (2021)* [23] who showed that IFRS 9-based credit provisioning curbs default rates.
3. NPLs moderate the growth–performance link negatively, consistent with *Adesina & Mwamba (2021)* [2], who note that rising NPLs erode the benefits of loan expansion in Sub-Saharan Africa.

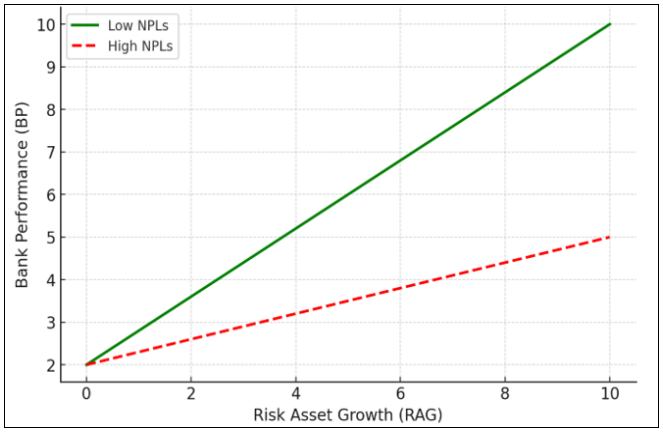

Fig 2: Interaction Effect of NPLs on the Risk Asset Growth–Performance Relationship

Practical Implications:

- Branches must strike a balance between aggressive loan growth and prudent monitoring.
- Investment in **credit technology, fintech partnerships, and early warning systems** is essential to sustain profitability.
- Regulators (CBN) should enforce continuous stress testing to mitigate systemic risks from loan expansion.

Benefits of Implementation:

- Improved profitability and efficiency at branch level.
- Lower system-wide vulnerability to banking crises.
- Enhanced confidence among depositors, investors, and regulators.

5.6 Limitations of the Study and Areas for Future Research

- **Limitations:**
  - Data limited to Nigerian banks; findings may not fully generalize to other Sub-Saharan economies.

- Self-reported survey responses may contain social desirability bias.
- Secondary CBN data is aggregated, limiting branch-level granularity.

- **Future Research:**
  - Comparative studies across African banking systems (e.g., Kenya, South Africa, Ghana).
  - Longitudinal studies to assess the lag effects of credit expansion on NPLs.
  - Incorporating machine learning approaches for predicting branch-level loan performance.

6. Conclusion

6.1 Summary

This study examined risk asset portfolio management and its influence on branch performance in Nigerian banks, with a focus on techniques to grow risk assets while minimizing non-performing loans (NPLs). The research was guided by three core questions:

1. Does risk asset growth significantly influence branch performance?
2. Do loan appraisal and monitoring practices minimize non-performing loans?
3. Do NPLs moderate the relationship between risk asset growth and branch performance?

Corresponding hypotheses were formulated and tested using a combination of survey data, interviews, and secondary data from the Central Bank of Nigeria (CBN).

Key findings indicate that:

- Risk asset growth has a significant positive effect on branch performance.
- Loan appraisal and monitoring practices are effective in reducing NPLs.
- NPLs act as a negative moderator, weakening the positive relationship between risk asset growth and branch performance.

The analysis further revealed that branches with robust credit assessment frameworks and consistent post-disbursement monitoring experienced higher portfolio quality and stronger performance outcomes. Conversely, branches with weaker risk management structures saw their profitability eroded by rising NPLs.

6.2 Conclusion

The study concludes that effective risk asset portfolio management is pivotal to enhancing the performance of Nigerian bank branches. While expanding credit portfolios is necessary to drive profitability, it must be matched with sound risk management strategies to contain default rates. The empirical results reinforce the notion that unchecked NPLs undermine performance gains from loan expansion, a finding consistent with contemporary literature on credit risk and bank stability.

By rigorously testing hypotheses, the study validates that branch-level performance depends not only on loan growth but also on the discipline embedded in portfolio management processes.

Contribution to Knowledge:

- The study contributes original insights into the branch-level dynamics of credit risk management in Nigerian banks, a level of granularity often overlooked in macro-level studies.
- It integrates both quantitative evidence and qualitative perspectives, offering a holistic view of how portfolio decisions affect performance outcomes.
- The findings strengthen the understanding of how NPLs function as a critical moderator, shaping the interplay between risk asset growth and branch efficiency.

6.3 Recommendations

Based on the findings, the study makes the following recommendations:

1. **Balanced Risk Asset Growth:** Banks should pursue credit expansion selectively, targeting sectors with proven repayment capacities, such as agriculture value chains, fintech-enabled SMEs, and renewable energy enterprises.
2. **Enhanced Loan Appraisal and Monitoring:** Branches should strengthen pre-disbursement due diligence and adopt real-time monitoring systems that flag early warning signals of default.
3. **Technology Adoption:** Investment in credit scoring analytics, AI-driven risk assessment, and digital loan tracking tools will help banks improve portfolio quality.
4. **Regulatory Oversight:** Regulators such as the CBN should intensify supervision by mandating regular stress testing, portfolio audits, and stricter NPL provisioning rules to safeguard financial stability.
5. **Capacity Building:** Continuous training of branch managers and credit officers in risk assessment techniques and regulatory compliance will ensure sustainable portfolio performance.

6.4 Concluding Remarks

This paper confirms that Nigerian banks could take a profitable and sustainable growth in their risk asset portfolio where credit growth has been undertaken with responsibility and coupled with a stringent monitoring system. The lessons have wider implications than just in Nigeria, also having useful implications in other emerging economies faced with similar issues of credit-growth versus portfolio quality.

The study provides an opportunity to reconsider the credit cultivation policies by prioritizing the objectives of asset development and limiting defaulting. In the final analysis, effective portfolio management is not only going to improve the performance of branch but also boost systemic resilience of Nigeria financial sector in general.

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