

PORTFOLIO OPTIMISATION AND FINANCIAL PERFORMANCE OF DEPOSIT MONEY BANKS IN NIGERIA: AN EMPIRICAL ANALYSIS OF ASSET ALLOCATION, DIVERSIFICATION, AND RISK MANAGEMENT

¹Ngbede Adikwu Ocholi, ²Prof. Maryam Abdu, & ³ Dr. Yusuf Hashim

^{1,2&3}Department of Business Administration, Kaduna State University

¹Email: ngbedeocholi@gmail.com.

Abstract

This study examines the effect of portfolio optimization specifically asset allocation, portfolio diversification, and risk management on the financial performance of deposit money banks in Nigeria between 2014 and 2023. Grounded in Modern Portfolio Theory (MPT) and extended through hybrid models like the Black-Litterman framework and AI-driven simulations, the study uses a multiple regression approach to analyse data from five systemically important banks. Findings reveal that only portfolio diversification has a statistically significant positive impact on performance, measured by Return on Assets (ROA), while asset allocation and risk management exhibit non-significant effects. These results underscore the critical importance of income diversification in enhancing profitability and resilience in Nigeria's volatile financial ecosystem. The study contributes a context-sensitive framework that links global portfolio theories with the operational realities of emerging market banking. It recommends that banks adopt dynamic asset models, improve real-time risk monitoring, and leverage data infrastructure for optimal performance. Policymakers are also urged to support innovation and data-driven practices to improve financial stability.

Keywords: Portfolio optimisation, Asset allocation, Portfolio diversification, Risk management, Bank performance, Nigeria, Return on Assets (ROA), Modern Portfolio Theory

1.1 Introduction

In emerging economies such as Nigeria, the banking sector serves as a critical conduit for financial intermediation, economic growth, and market stability. However, in recent years, Nigerian deposit money banks have experienced significant performance instability, largely attributed to inconsistent portfolio management strategies. According to Umeh and Chukwu (2023), the average return on assets (ROA) for Nigerian banks declined from 3.1% in 2021 to 2.4% in 2022, a contraction closely tied to rising non-performing loans and weak asset reallocation practices. The Central Bank of Nigeria (2023) notes that deteriorating portfolio performance has also hindered credit expansion, weakened investor confidence, and undermined the sector's contribution to national economic resilience.

Globally, banks that implement systematic portfolio optimization combining diversified asset structures, responsive allocation frameworks, and active risk controls have consistently recorded stronger performance across market cycles (Adebayo & Yusuf, 2024; Bank for International Settlements, 2021). These institutions often achieve higher returns per unit of risk, leveraging technologies such as predictive analytics to anticipate shifts in asset values and optimise capital deployment accordingly (Zhu & Wang, 2023). By contrast, Nigerian banks have traditionally concentrated their investments in narrowly defined domestic loan portfolios, often without sufficient risk mitigation or sectoral diversification (Chang, Timo, & Alan, 2024). This insular investment approach exposes institutions to compounding risks arising from inflation, political instability, and regulatory pressures.

Empirical studies within the Nigerian context highlight the underutilisation of portfolio tools such as credit concentration controls, asset class rebalancing, and liquidity simulation (Oladele, 2024; Amediku, 2023). While isolated interventions such as geographic diversification or loan reclassification have yielded marginal improvements, few studies assess the holistic effect of integrated portfolio optimisation on banking performance. This gap limits strategic clarity, particularly for decision-makers seeking to balance profitability with resilience in an increasingly volatile market.

Theoretically, Modern Portfolio Theory (MPT) provides a useful foundation for exploring optimal return-risk balance in financial portfolios (Markowitz, 1952). However, the dynamic and regulatory-specific nature of Nigeria's financial ecosystem demands more context-sensitive adaptations of this framework, incorporating liquidity thresholds, credit risks, and institutional characteristics such as bank size. This study therefore contributes to the literature by empirically examining the collective influence of asset allocation, portfolio diversification, and risk management on the performance of systemically important banks in Nigeria.

In doing so, it addresses three interrelated questions: To what extent does asset allocation affect the financial performance of Nigerian deposit money banks? How does portfolio diversification contribute to stability and returns in a constrained macroeconomic environment? And how effective are existing risk management practices in insulating performance against shocks? These questions are addressed through a robust analytical model, utilising a 10-year dataset across five banks listed on the Nigerian Stock Exchange and authorised for international operations.

The findings offer significant implications for investment managers, regulators, and policymakers. For investment managers, understanding the nuanced interplay of portfolio variables enables data-driven decision-making. Regulators may use the insights to refine prudential guidelines and strengthen sectoral stability. Policymakers, meanwhile, will benefit from evidence-based recommendations for institutional reforms. More broadly, the study contributes to portfolio optimisation theory in developing economies, providing a regional lens through which global models may be reinterpreted.

Objectives of the Study

The general objective of this study is to investigate how investment portfolio management practices, particularly asset allocation, portfolio diversification, and risk management strategies, collectively influence the financial performance of deposit money banks in Nigeria. The study seeks to provide a comprehensive understanding of how these key components of portfolio management interact to enhance financial stability, profitability, and overall operational efficiency within the Nigerian banking sector.

Research Hypotheses

H₀₁: Asset Allocation has no significant effect on bank performance.

H₀₂: Portfolio Diversification has no significant effect on bank performance.

H₀₃: Portfolio Risk Management has no significant effect on bank performance.

2.1 Literature Review

Concept of Asset Allocation

Asset allocation refers to the strategic distribution of a bank's resources across various investment categories typically loans, securities, cash reserves, and other financial instruments to optimize returns within a given risk profile. It is a foundational principle in financial

management that directly influences a bank's exposure to interest rate fluctuations, liquidity constraints, and inflation shocks (Ferson & Qian, 2022). In dynamic and inflation-prone economies like Nigeria, effective asset allocation is indispensable for enhancing operational efficiency and insulating profitability from market volatility.

Traditionally, Nigerian banks have relied heavily on loan portfolios, particularly within domestic commercial and consumer lending markets. However, such concentrated asset positions are increasingly seen as vulnerable to economic downturns and regulatory tightening (Raji & Akinola, 2023). International evidence supports the repositioning of bank assets into diversified securities and alternative investments such as corporate bonds, government sukuk, and offshore instruments to improve returns and mitigate concentration risk (Chang, Timo, & Alan, 2024). The evolving complexity of financial markets calls for dynamic allocation models that adjust to macroeconomic indicators, including interest rate movements and foreign exchange volatility (Zhang et al., 2022).

In this study, asset allocation is defined as the tactical and strategic assignment of bank resources across a diversified set of financial instruments to achieve an optimal balance between liquidity, safety, and profitability, while aligning with both market signals and regulatory thresholds.

Concept of Portfolio Diversification

Portfolio diversification involves the deliberate spread of investments across a variety of asset classes, income streams, geographies, or industries to reduce unsystematic risk and promote long-term stability. Rooted in Modern Portfolio Theory (Markowitz, 1952), diversification reduces the likelihood that negative performance in one segment will significantly impair the entire portfolio. For Nigerian deposit money banks operating in a volatile macroeconomic environment, diversification remains a critical yet underexploited strategy (Amediku, 2023).

Diversification in the banking sector goes beyond holding different financial instruments; it extends to income-generating operations such as asset management, foreign currency holdings, and cross-border investments. Empirical studies confirm that banks with diversified income sources exhibit more stable earnings, lower impairment charges, and enhanced resilience during downturns (Solnik & McLeavey, 2022; Oladele, 2024). However, Nigerian banks continue to exhibit high geographic and asset class concentration, thereby increasing their exposure to local economic disruptions.

For the purpose of this study, portfolio diversification is conceptualized as a strategic risk management approach wherein a bank distributes its resources across multiple financial and operational domains to ensure income stability, reduce exposure to correlated risks, and optimize overall performance.

Concept of Portfolio Risk Management

Portfolio risk management encompasses the processes and practices deployed to identify, assess, and mitigate threats to a bank's investment returns and capital base. These include credit risk, market risk, liquidity risk, and operational risk. With Nigeria's financial environment marked by currency instability, regulatory volatility, and high inflation, banks must adopt advanced risk management frameworks to remain solvent and competitive (Zhu & Wang, 2023).

Traditional tools such as Value at Risk (VaR), stress testing, and scenario modelling remain relevant; however, they are increasingly being complemented by machine learning, AI-driven credit scoring, and real-time analytics (Anamol, Anjaneyulu, & Aseem, 2023; Ji, 2023). In

Nigeria, many banks still rely on static risk thresholds and limited real-time risk visibility, making them susceptible to systemic shocks (Coelho, Singh, & Adeoye, 2023). The integration of dynamic, predictive risk models is vital for early warning systems and responsive portfolio adjustments.

In this research, portfolio risk management is defined as an integrated system of frameworks, tools, and processes that enable Nigerian deposit money banks to proactively identify and control exposure to financial and operational risks affecting their portfolio outcomes.

Concept of Bank Performance

Bank performance is commonly evaluated through profitability ratios (e.g., return on assets [ROA], return on equity [ROE]), efficiency indicators (e.g., cost-to-income ratio), and risk-adjusted returns (e.g., Sharpe ratio). In the Nigerian context, sustained profitability and resilience are under increasing threat due to inflation, rising loan defaults, and poor diversification (Umeh & Chukwu, 2023).

Strong performance is typically associated with adaptive portfolio strategies that align with evolving economic signals and regulatory benchmarks (Jorion, 2021). Banks that engage in deliberate performance management through the use of real-time dashboards, scenario analysis, and efficient capital deployment achieve better stakeholder outcomes and preserve long-term stability (Eccles, 2023).

For this study, performance is operationalised through a composite assessment of ROA view of how asset allocation, diversification, and risk control influence the financial health of Nigerian deposit money banks.

Theoretical Framework

This study is anchored on Modern Portfolio Theory (MPT) as proposed by Harry Markowitz (1952), which posits that an optimised investment portfolio maximises return for a given level of risk through diversification and efficient asset allocation. MPT forms the intellectual basis for most contemporary banking strategies related to capital deployment and risk-adjusted returns. It emphasises that combining uncorrelated or negatively correlated assets can substantially reduce portfolio volatility, a principle particularly useful in volatile economies like Nigeria's (Fabozzi & Grant, 2021).

However, traditional MPT has limitations in high-volatility, low-liquidity environments such as Nigeria. Therefore, recent extensions of MPT including dynamic asset rebalancing (Zhang et al., 2022), behavioural portfolio theory, and AI-enhanced portfolio selection (Kumari & Professor, 2024) are increasingly relevant. These updated frameworks incorporate not just risk and return, but real-time information, macroeconomic variables, and human biases, which are all salient to the Nigerian banking sector.

This study adopts a hybrid theoretical approach, combining MPT with contemporary extensions such as the Black-Litterman model and machine-learning-based portfolio rebalancing frameworks. These models allow for a more nuanced analysis of how Nigerian banks can dynamically allocate, diversify, and de-risk their portfolios to meet performance benchmarks.

2.1 Empirical Review

Recent empirical literature has increasingly addressed the role of portfolio optimisation in banking performance, though very few studies offer a composite model that includes asset allocation, diversification, and risk management in tandem.

For instance, Meher and Mishra (2024) demonstrated that dynamically rebalanced portfolios, using Monte Carlo simulations and Black-Litterman modelling, outperformed static portfolios in the Indian market. While insightful, the study was not tailored to regulated banking portfolios or emerging African markets.

Deng, Zhou, and Cao (2024) introduced a Copula-GARCH and Black-Litterman hybrid framework that produced superior Sharpe ratios compared to traditional mean-variance models. Yet, they acknowledged that data intensity and model complexity limit real-time application in underdeveloped financial systems like Nigeria's.

In the African context, Amediku (2023) found that diversified Nigerian banks recorded 30% lower earnings volatility during the 2020–2022 downturn. Similarly, Oladele (2024) concluded that banks with robust credit concentration controls experienced an 18% reduction in impairment charges. However, these studies isolated individual strategies and did not assess their cumulative effect on performance.

Machine learning and AI are also gaining relevance. Anamol et al. (2023) found that AI systems enhanced real-time risk detection and decision-making in Indian and Southeast Asian financial institutions. Kumari and Professor (2024) further demonstrated that reinforcement learning algorithms improved portfolio adjustment efficiency and return volatility control. However, most of these studies remain theoretical or based on global datasets, limiting their application in Nigeria's banking sector.

There is limited integration of macroeconomic constraints into optimisation frameworks. For example, Rampilla, Bajpe, and Kumari (2024) used panel regression to evaluate how interest rate and inflation fluctuations affect non-performing assets globally. They recommended macro-sensitive credit and liquidity models a perspective highly applicable to Nigeria's inflation-prone environment.

The few Nigerian studies that do exist such as Michael, Aca, and Fcti (2016) used static mean-variance analysis on a limited dataset, offering basic diversification models without dynamic rebalancing or risk simulation. Similarly, Raji and Akinola (2023) examined liquidity and performance correlations but did not model risk-adjusted portfolio strategies.

In sum, while the literature affirms the relevance of asset allocation, diversification, and risk management in improving bank performance, there remains a gap in empirical studies that integrate these strategies into a unified optimisation framework suited to Nigeria's complex banking landscape. This study aims to fill that gap by offering a composite, context-specific model of portfolio optimisation for Nigerian deposit money banks, grounded in theory but informed by real-world operational constraints.

3.1 Methodology

This study employed a correlation research design to examine the relationship between portfolio optimisation strategies specifically asset allocation, portfolio diversification, and portfolio risk management and the financial performance of deposit money banks in Nigeria. A correlation design was deemed appropriate as it allows for the empirical assessment of associations among naturally occurring financial variables without manipulation, offering insights into the extent to which portfolio decisions influence performance outcomes in a real-world banking environment.

The study focused on five systemically important banks with international licences: Access Bank Plc, First Bank of Nigeria Plc, Guaranty Trust Bank Plc, United Bank for Africa Plc, and

Zenith Bank Plc. These banks were purposively selected based on their asset base, market influence, and consistent public reporting. The period under review spanned ten years (2014–2023), capturing periods of macroeconomic fluctuation, regulatory reforms, and financial instability, thereby ensuring robustness in the data.

Secondary data were extracted from audited annual financial statements published by the selected banks. All monetary values were reported in naira and inflation-adjusted where necessary to maintain consistency across years. Data analysis was conducted using IBM SPSS version 25.

Bank performance, the dependent variable, was measured using return on assets (ROA). ROA was calculated as net income divided by total assets. These metrics capture profitability (Zhu & Chen, 2023; Dang, 2021).

The independent variables were clearly defined and operationalized. Asset allocation was proxied by the ratio of loans to total assets and the ratio of investment in securities to total assets, capturing the bank's strategic distribution of capital (Ferson & Qian, 2022). Portfolio diversification was measured using the Herfindahl-Hirschman Index (HHI), calculated from the proportion of total income derived from interest, fees, and trading operations. Lower HHI values indicate greater diversification and reduced income concentration (Solnik & McLeavey, 2022). Portfolio risk management was evaluated through three indicators: the non-performing loan ratio (NPL), the loan loss provision ratio (LLP), and the capital adequacy ratio (CAR), all of which reflect the bank's capacity to identify, provision for, and absorb credit risk (Jorion, 2021; Adebayo & Yusuf, 2024).

To test the relationship between the variables, the study employed multiple regression analysis. This technique was suitable for examining the joint and individual effects of the three portfolio optimisation dimensions on performance indicators. The model was estimated using the enter method in SPSS, with assumptions of linearity, homoscedasticity, and normality verified through residual analysis and diagnostic plots.

The econometric model guiding the analysis is formally expressed as:

$$\text{PERF}_{it} = \beta_0 + \beta_1 \text{ASAL}_{it} + \beta_2 \text{PODI}_{it} + \beta_3 \text{PRMA}_{it} + \varepsilon_{it}$$

Where:

PERF_{it} = performance of bank i at time t (measured by ROA)

ASAL_{it} = asset allocation of bank i at time t

PODI_{it} = portfolio diversification of bank i at time t

PRMA_{it} = portfolio risk management of bank i at time t

β_0 = regression constant

β_1 – β_3 = coefficients of independent variables

ε_{it} = error term

4.1 Discussion and Result

Table 1 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance	Skewness	Kurtosis		
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
PERF	50	.03	.06	.0456	.00808	.000	-.212	.337	-.962	.662
ASAL	50	.40	.70	.5494	.09602	.009	-.031	.337	-1.339	.662
PODI	50	.37	.89	.6694	.13883	.019	-.335	.337	-1.005	.662
PRMA	50	.03	.08	.0553	.01550	.000	-.145	.337	-1.308	.662
Valid N (listwise)	50									

Source: SPSS, OUTPUT, 2025

Table 1 presents the descriptive statistics for the variables used in the study: Bank Performance (PERF), Asset Allocation (ASAL), Portfolio Diversification (PODI), and Portfolio Risk Management (PRMA), based on 50 firm-year observations from five systemically important Nigerian banks over a ten-year period. The mean value of bank performance (PERF) is 0.0456, indicating that, on average, the return on assets across the banks was approximately 4.56% during the study period. The standard deviation is 0.00808, suggesting low variability in performance across banks and years. The minimum and maximum values range from 0.03 to 0.06, confirming a relatively tight distribution. The skewness value of -0.212 and kurtosis of -0.962 indicate a slight leftward skew and a flatter distribution than the normal curve, but within acceptable thresholds.

Asset Allocation (ASAL), defined as the ratio of loans to total assets, has a mean of 0.5494, implying that on average, 54.94% of total bank assets were allocated to loan portfolios. The values range between 0.40 and 0.70, reflecting variation in lending intensity among the banks. The standard deviation of 0.09602 reveals moderate dispersion. The skewness is marginally negative (-0.031), indicating a nearly symmetric distribution, while kurtosis at -1.339 suggests a broader and flatter distribution than normal.

Portfolio Diversification (PODI), measured using the Herfindahl-Hirschman Index derived from income categories, exhibits a mean of 0.6694 and ranges from 0.37 to 0.89. A lower value on the HHI scale indicates greater diversification, while higher values reflect income concentration. The relatively wide range and a standard deviation of 0.13883 suggest considerable differences in income mix across banks. The skewness of -0.335 indicates a slight leftward skew, and a kurtosis of -1.005 again points to a flat-tailed distribution.

Portfolio Risk Management (PRMA), composed of indicators such as non-performing loan ratio, loan loss provision ratio, and capital adequacy, shows a mean value of 0.0553, with a range between 0.03 and 0.08. The standard deviation of 0.01550 indicates low dispersion, suggesting relative consistency in risk control practices among the selected banks. The

skewness value of -0.145 implies a minor left skew, and the kurtosis of -1.308 shows a platykurtic distribution, meaning the tails are lighter than those of a normal distribution.

All variables show reasonable levels of dispersion, with no indication of extreme outliers or significant skewness. The skewness and kurtosis statistics fall within acceptable bounds for the assumption of normality, supporting the appropriateness of subsequent regression analysis. These descriptive results provide a preliminary understanding of the distributional characteristics of the dataset and reinforce the robustness of the sample for inferential statistical testing.

Table 2 Correlations

		PERF	ASAL	PODI	PRMA
PERF	Pearson Correlation	1	.122	.348*	-.217
	Sig. (2-tailed)		.399	.013	.129
	N	50	50	50	50
ASAL	Pearson Correlation	.122	1	-.080	.093
	Sig. (2-tailed)	.399		.580	.520
	N	50	50	50	50
PODI	Pearson Correlation	.348*	-.080	1	-.259
	Sig. (2-tailed)	.013	.580		.069
	N	50	50	50	50
PRMA	Pearson Correlation	-.217	.093	-.259	1
	Sig. (2-tailed)	.129	.520	.069	
	N	50	50	50	50

*. Correlation is significant at the 0.05 level (2-tailed).

Source: SPSS, OUTPUT, 2025

Table 2 displays the Pearson correlation coefficients among the study variables: Bank Performance (PERF), Asset Allocation (ASAL), Portfolio Diversification (PODI), and Portfolio Risk Management (PRMA), based on 50 observations. The results show that Portfolio Diversification (PODI) has a moderate positive and statistically significant correlation with bank performance ($r = 0.348$, $p = 0.013$) at the 5% level. This suggests that increased income diversification is associated with improved bank performance, aligning with empirical evidence that diversified income streams can mitigate volatility and enhance profitability in financial institutions (Solnik & McLeavey, 2022). Conversely, Portfolio Risk Management (PRMA) is negatively correlated with performance ($r = -0.217$), though this relationship is not statistically significant ($p = 0.129$), indicating that higher provisioning or conservative risk buffers may not directly enhance performance in the short term.

The correlation between Asset Allocation (ASAL) and bank performance is positive but weak ($r = 0.122$) and not statistically significant ($p = 0.399$). This implies that the extent to which banks allocate assets to loans does not significantly influence their profitability within the observed timeframe. Additionally, ASAL exhibits very weak correlations with both PODI ($r = -0.080$) and PRMA ($r = 0.093$), with p -values of 0.580 and 0.520 respectively, confirming the absence of multicollinearity risks among the predictors.

Notably, PODI shows a mild negative correlation with PRMA ($r = -0.259$), approaching significance ($p = 0.069$), which may indicate that banks with highly diversified income streams tend to apply relatively lower provisions for risk, possibly reflecting lower exposure to concentrated credit portfolios. Overall, the correlation matrix supports the suitability of the variables for regression analysis, as none of the predictor variables are highly correlated with

one another, thus reducing the likelihood of multicollinearity and ensuring the stability of regression estimates.

Table 3 Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
					R Square Change	F Change	df1	df2	Sig. Change	Durbin-Watson
1	.505 ^a	.464	.110	.00762	.464	3.010	3	46	.040	2.341

a. Predictors: (Constant), PRMA, ASAL, PODI

b. Dependent Variable: PERF

Source: SPSS, OUTPUT, 2025

Table 3 presents the summary statistics of the regression model evaluating the combined influence of Portfolio Risk Management (PRMA), Asset Allocation (ASAL), and Portfolio Diversification (PODI) on Bank Performance (PERF) among Nigerian deposit money banks. The multiple correlation coefficient (R) is 0.505, indicating a moderate positive linear relationship between the predictor variables and bank performance. More importantly, the model reports an R Square value of 0.464, implying that approximately 46.4% of the variance in bank performance is jointly explained by the three independent variables. This is a substantial explanatory power for financial modelling in emerging market banking, where external economic shocks, regulatory volatility, and sector-specific inefficiencies often limit the predictability of performance outcomes.

The Adjusted R Square, which accounts for the degrees of freedom and sample size, is reported at 0.110. This considerable drop from the unadjusted R Square suggests that while the predictors are jointly significant, individual contributions may not be equally strong, and a portion of the explanatory power may be influenced by sampling variability. Nevertheless, the standard error of the estimate at 0.00762 confirms that the residuals between observed and predicted performance values are minimal, thereby supporting the internal consistency of the model.

The F-statistic value of 3.010, with degrees of freedom (df1 = 3, df2 = 46) and an associated significance value of 0.040, further confirms the model's statistical validity at the 5% significance level. This indicates that the regression model as a whole significantly improves prediction of bank performance, and the joint inclusion of PRMA, ASAL, and PODI is not due to random chance. Finally, the Durbin-Watson statistic of 2.341 falls well within the acceptable threshold (1.5 to 2.5), suggesting that the residuals are not auto-correlated, which validates the assumption of independence in error terms—an essential condition for linear regression integrity.

Table 4 ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.001	3	.000	3.010	.040 ^b
	Residual	.003	46	.000		
	Total	.003	49			

a. Dependent Variable: PERF

b. Predictors: (Constant), PRMA, ASAL, PODI

Source: SPSS, OUTPUT, 2025

Table 4 presents the Analysis of Variance (ANOVA) results for the regression model examining the joint effect of Portfolio Risk Management (PRMA), Asset Allocation (ASAL), and Portfolio Diversification (PODI) on Bank Performance (PERF). The regression sum of squares is 0.001, indicating the amount of variation in performance explained by the model. The residual (or error) sum of squares is 0.003, representing the portion of variance not explained by the predictors. The total sum of squares is 0.003, confirming that the model accounts for a significant share of the total variance in the dependent variable.

With 3 degrees of freedom for the regression and 46 degrees of freedom for the residual, the model yields an F-statistic of 3.010. The corresponding significance level ($p = 0.040$) is below the conventional 0.05 threshold, indicating that the model is statistically significant. This result implies that the combination of PRMA, ASAL, and PODI provides a meaningful improvement in explaining variations in bank performance compared to a model with no predictors.

In essence, the ANOVA output confirms that the regression model significantly predicts bank performance. While the individual contributions of the variables are examined in the coefficients table, this overall F-test validates the inclusion of the predictors in the model. Therefore, the study supports the hypothesis that portfolio structure and management practices jointly influence financial outcomes in Nigerian deposit money banks.

Table 5 Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
1	(Constant)	.030	.010	3.018	.004
	ASAL	.014	.011	1.192	.239
	PODI	.019	.008	2.304	.026
	PRMA	-.078	.073	-1.064	.293

a. Dependent Variable: PERF

Source: SPSS, OUTPUT, 2025

Table 5 presents the regression coefficients, indicating the individual contribution of each predictor Asset Allocation (ASAL), Portfolio Diversification (PODI), and Portfolio Risk Management (PRMA) to Bank Performance (PERF). The constant (intercept) is 0.030, and it is statistically significant ($p = 0.004$), suggesting that when all independent variables are held constant, the baseline level of bank performance is 3.0%.

Among the predictors, Portfolio Diversification (PODI) is the only statistically significant variable at the 5% level, with an unstandardised coefficient (B) of 0.019 and a standard error of 0.008. The corresponding standardised beta coefficient is 0.322, and the t-value is 2.304 ($p = 0.026$). This indicates a positive and significant relationship between income diversification and bank performance. In practical terms, a one-unit increase in PODI leads to a 1.9% increase in performance, holding other variables constant. This finding underscores the strategic importance of generating revenue from multiple sources such as interest, fees, and trading in improving profitability.

Asset Allocation (ASAL) has a positive coefficient of 0.014, suggesting a positive association with bank performance. However, the relationship is not statistically significant ($p = 0.239$), and the beta coefficient of 0.162 indicates a weak effect size. This implies that while a greater proportion of loan-based assets may correlate with improved performance, the effect is neither strong nor robust enough to be considered conclusive within this model.

On the other hand, Portfolio Risk Management (PRMA) demonstrates a negative but statistically insignificant relationship with bank performance, with a coefficient of -0.078, standard error of 0.073, beta of -0.149, and a p-value of 0.293. Although the sign of the coefficient suggests that aggressive risk provisioning or conservative capital buffers may slightly dampen short-term returns, the lack of statistical significance means this effect cannot be generalised. It is possible that the benefits of strong risk management are more visible over longer periods or under stress-test conditions, which are beyond the temporal scope of this study.

Test of Hypotheses

Hypothesis 1 (H_{01}): Asset Allocation has no significant effect on bank performance. The regression results indicate that Asset Allocation (ASAL) has an unstandardised coefficient of $B = 0.014$, meaning that for every one-unit increase in ASAL, bank performance (PERF) is expected to increase by 0.014 units, assuming all other variables remain constant. However, the corresponding p-value of 0.239 exceeds the 0.05 significance level, and the effect is not statistically significant. Therefore, we fail to reject the null hypothesis (H_{01}). While the direction of the coefficient implies a positive relationship, the absence of statistical significance suggests that variations in asset allocation such as increasing credit-based investments do not reliably predict changes in performance across Nigerian banks during the period assessed. This could reflect regulatory constraints, inefficiencies in credit recovery, or external economic instability that dilutes potential gains from asset-heavy strategies.

Hypothesis 2 (H_{02}): Portfolio Diversification has no significant effect on bank performance. The coefficient for Portfolio Diversification (PODI) is $B = 0.019$, with a standard error of 0.008 and a p-value of 0.026, which is below the 5% significance threshold. Thus, we reject the null hypothesis (H_{02}) and conclude that portfolio diversification exerts a statistically significant and positive effect on bank performance. Specifically, the result implies that for every one-unit increase in PODI, bank performance is expected to rise by 0.019 units, controlling for other factors in the model. This finding underscores the strategic value of income diversification, such as expanding revenue from non-interest income (fees, commissions, and trading), in driving profitability and resilience in Nigeria's banking sector. It affirms earlier empirical work that identifies income diversity as a buffer against interest rate volatility and loan default risks.

Hypothesis 3 (H_{03}): Portfolio Risk Management has no significant effect on bank performance. Portfolio Risk Management (PRMA) has a coefficient of $B = -0.078$, with a standard error of 0.073 and a p-value of 0.293, indicating that the effect is not statistically significant. As such, we fail to reject the null hypothesis (H_{03}). The negative sign suggests that a one-unit increase in PRMA representing heightened risk aversion or conservative provisioning may lead to a 0.078 unit decrease in bank performance, all else held constant. However, since the result lacks statistical significance, no firm conclusions can be drawn. This may indicate that in the short run, prudent risk management practices reduce operational risk exposure but do not translate immediately into improved profitability. It also highlights the possibility that risk control measures deliver long-term stability rather than short-term returns, particularly in environments with volatile macro-financial conditions.

Discussion of Findings

The empirical results from this study provide nuanced insights into how portfolio optimisation strategies specifically asset allocation, portfolio diversification, and risk management shape bank performance within the context of Nigeria's evolving financial landscape. Grounded in Modern Portfolio Theory (MPT) and its contemporary extensions, the analysis confirms that only one of the three dimensions portfolio diversification (PODI) exerts a statistically

significant and positive influence on performance, while asset allocation (ASAL) and portfolio risk management (PRMA) show non-significant effects.

The significance of portfolio diversification ($B = 0.019$, $p = 0.026$) reinforces a core tenet of MPT: risk-adjusted returns can be enhanced when income streams are spread across uncorrelated sources. Specifically, the result indicates that a one-unit increase in income diversification yields a 1.9% rise in performance, holding other factors constant. This finding aligns with Markowitz's proposition that diversification reduces portfolio variance without necessarily sacrificing returns (Fabozzi & Grant, 2021). In Nigeria's context characterised by regulatory shifts, inflation volatility, and credit market fragility diversification is not merely a theoretical construct but a practical necessity. It serves as a buffer against cyclical shocks in loan repayment performance, interest rate fluctuations, and sector-specific downturns. The result empirically supports Amediku (2023), who found that Nigerian banks with diversified portfolios experienced markedly lower earnings volatility during the COVID-19 era.

Conversely, asset allocation (ASAL), with a coefficient of $B = 0.014$ and a p -value of 0.239, does not show a statistically significant effect, despite its conceptual importance in capital structuring. While MPT encourages optimal allocation across asset classes to balance return and risk, this finding suggests that increasing loan-dominant exposures in Nigeria does not guarantee better performance. This outcome may reflect the inefficiencies and credit risks embedded in Nigeria's loan markets, including high non-performing loan (NPL) ratios and regulatory caps on lending. It also resonates with the limitations of static asset allocation strategies in dynamic, high-volatility environments precisely the critique that has given rise to extensions of MPT such as dynamic rebalancing (Zhang et al., 2022) and AI-guided asset structuring (Kumari & Professor, 2024). Thus, while ASAL remains relevant, its effectiveness appears conditional on active monitoring, rebalancing, and integration with macroeconomic foresight.

Portfolio Risk Management (PRMA), which returned a coefficient of $B = -0.078$ with a non-significant p -value of 0.293, offers an unexpected yet theoretically reconcilable insight. The negative sign implies that increased provisioning or stricter risk control may dampen short-term returns, likely due to increased capital buffers or write-downs. However, the lack of statistical significance suggests that the relationship is not robust within the time frame of this study. This supports arguments by Rampilla, Bajpe, and Kumari (2024), who posited that the effects of risk sensitivity may manifest more strongly during prolonged economic shocks or across different stages of the credit cycle. Moreover, the insignificance may reflect measurement constraints or the inability of conventional risk indicators to capture real-time systemic threats in Nigeria's data-poor environment. As Oladele (2024) highlighted, banks with robust credit controls experienced reduced impairments, yet such benefits may not immediately reflect in profit margins. Thus, PRMA's role may be more protective than performance-enhancing in the short term.

From a theoretical standpoint, the results partially validate MPT's foundational propositions, particularly the significance of diversification. However, the limited impact of asset allocation and risk management affirms the need for hybrid theoretical models, including the Black-Litterman framework, which allows for investor views and macroeconomic overlays, and machine-learning-based asset optimisation, which accounts for data asymmetry and behavioural biases—factors especially pronounced in Nigeria's banking sector. These advanced models offer a richer toolkit for managing not just volatility, but also liquidity constraints, customer behaviour, and policy uncertainty, which classical MPT does not adequately address.

Comparatively, this study bridges gaps left in prior literature. While studies by Deng, Zhou, and Cao (2024) and Meher and Mishra (2024) advanced global portfolio theories using sophisticated simulations, they overlooked applicability in underdeveloped banking systems. Similarly, Nigerian works by Michael, Aca, and Fcti (2016) and Raji and Akinola (2023) either lacked empirical breadth or excluded integrated modelling. By jointly assessing allocation, diversification, and risk management, this research delivers a more composite and context-sensitive model, consistent with emerging demands for custom optimisation strategies in African banking ecosystems.

5.1 Conclusion and Recommendations

This study investigated the effect of portfolio optimisation strategies specifically asset allocation, portfolio diversification, and risk management on the performance of listed deposit money banks in Nigeria between 2014 and 2023. Anchored on the theoretical foundations of Modern Portfolio Theory (MPT) and its contemporary extensions such as the Black-Litterman model and AI-enhanced asset modelling, the study provides an empirical assessment of how Nigerian banks can structure their portfolios to optimise risk-adjusted returns in a volatile macroeconomic environment.

The findings reveal that portfolio diversification is the only statistically significant driver of bank performance, reinforcing MPT's central thesis that income diversification enhances returns by reducing systemic exposure. In contrast, asset allocation and portfolio risk management, although positively and negatively related to performance respectively, did not show significant explanatory power within the model.

These results underscore the practical reality that diversification strategies spanning interest income, non-interest fees, and trading operations are particularly effective in the Nigerian context, where regulatory unpredictability and credit risk remain endemic. The insignificance of asset allocation and risk management may reflect the need for dynamic rebalancing techniques, better real-time data analytics, and institution-specific portfolio modelling, all of which are consistent with recent global advances in banking portfolio optimisation.

Providing a unified framework that integrates three pillars of portfolio strategy, this study contributes both theoretically and empirically to the limited but growing literature on optimisation practices in emerging-market banking systems. It bridges the gap between global portfolio theory and Nigeria's unique operational realities, thus offering a template for context-specific financial strategy.

This study recommends that Nigerian banks strategically deepen income diversification by expanding non-interest income sources such as digital banking and agency services, adopt dynamic asset allocation frameworks using real-time analytics despite statistical insignificance to align with sector risks, enhance risk management by embedding macro-sensitive tools like inflation-adjusted credit models and early warning systems, train risk and treasury teams on hybrid portfolio strategies such as Black-Litterman and Copula-GARCH models to improve decision-making under uncertainty, and finally, urge policymakers and regulators to strengthen data infrastructure and support innovation to facilitate a shift towards a robust, analytics-driven, performance-oriented banking environment.

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