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Capital Management and Profitability of Listed Financial Services Firms in Nigeria: Moderating Role of Regulatory Framework

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Abstract

Purpose – This study examine the effect of capital management on the profitability of listed financial-services firms in Nigeria and investigates whether the regulatory framework (capital adequacy) moderates that relationship.

Design/methodology/approach – Adopting an ex post facto design, the study uses panel data from 22 financial-services firms listed on the Nigerian Exchange over 2012 to 2024. Interest-income performance is proxied by an interest-income index used to measure profitability, and five capital-management components (human, innovation, relational, structural and capital-employed) are regressed on it. Pooled OLS, fixed-effects and random-effects estimators are compared using the Hausman, Breusch-Pagan and Chow tests, with interaction terms between each component and the capital-adequacy ratio capturing the moderating effect; robustness is assessed through heteroskedasticity, autocorrelation and cross-sectional-dependence diagnostics.

Findings – Capital-management components jointly and significantly affect profitability proxy by interest-income performance, but their individual effects are heterogeneous. Structural capital and capital-employed management have positive and significant effects, whereas human-capital management is negative in the baseline model. Introducing the capital-adequacy ratio significantly raises the model's explanatory power and reshapes these relationships, strengthening, weakening or reversing individual effects, and thereby confirming that the regulatory framework moderates the capital-performance link.

Research limitations/implications – The study is limited to listed Nigerian financial-services firms and to an accounting-based, interest-income measure of performance. Future research could examine unlisted firms, compare emerging economies, adopt market-based and risk-adjusted performance measures, and apply dynamic panel estimators to address potential endogeneity.

Practical implications – Managers should strengthen structural capital and capital-employed efficiency and align human-capital investment with regulatory requirements, while regulators should calibrate capital-adequacy rules that reward efficient capital deployment without eroding interest margins, thereby supporting financial-system stability, public confidence and access to finance.

Originality/value – The study jointly models multiple capital-management components with the regulatory framework as an explicit moderator, integrating the resource-based view with regulatory capital framework theory to offer a theory-consistent explanation for the mixed evidence in prior research, and provides recent evidence from an under-studied emerging market.

JEL: G21, G28, O34

1.0 Introduction

The performance of financial services firms have increasingly attracted scholarly and policy attention, particularly in emerging economies where financial systems play a critical role in economic development and stability (Campanella et al., 2023; Mawutor et al., 2023; Mustafa et al., 2024; Haddad et al., 2023; Orshi et al., 2026). In Nigeria, the financial services sector remains central to economic growth, yet it continues to face challenges arising from market volatility, regulatory pressures, technological disruptions, and inefficiencies in resource utilization (Orshi et al., 2026). These challenges have intensified the need to identify key drivers of profitability, especially those related to how firms manage different forms of capital. Profitability, commonly proxied by return on assets (ROA) and return on equity (ROE), reflects the ability of firms to deploy resources efficiently to generate earnings and sustain competitive advantage in a dynamic business environment (Le & Nguyen, 2020; Haris et al., 2019; Weqar et al., 2020; Barak & Sharma, 2023; Zafar & Yasin, 2025). For financial-services firms, however, interest income is the principal earnings stream and a direct indicator of how effectively intermediation resources are converted into revenue; this study therefore adopts interest-income performance, captured through an interest-income index, as its performance construct.

Over the years, contemporary literature has increasingly shifted focus from traditional financial capital to a broader conceptualization of capital, particularly intellectual capital and its components, as critical determinants of firm performance and profitability (Yalama, 2013; Tran & Vo, 2018; Xu et al., 2019; Yaseen & Al-Amarneh, 2021; Dumah & Gaywala, 2025; Shiue & Elvina, 2025). Intellectual capital, either integrated or segregated into its components, human capital, relational capital, innovative capital, structural capital, and capital employed efficiency, has been widely recognized as a strategic resource that enhances value creation, operational efficiency, innovation, and long-term competitiveness in financial institutions (Soriya & Narwal, 2015; Marsintauli et al., 2023; Mustafa et al., 2024; Zafar & Yasin, 2025). Several studies from diverse countries indicates that effective management of these capitals significantly improves profitability and financial performance of banks and other financial service firms (Le & Nguyen, 2020; Haris et al., 2019; Weqar et al., 2020; Berhe, 2025).

Human capital, which reflects employees' knowledge, skills, and competencies, has been identified as a major driver of profitability in the financial services sector (Weqar et al., 2020; Barak & Sharma, 2023; Zafar & Yasin, 2025). Studies show that investments in staff development and training enhance employees' ability to utilize knowledge resources effectively, thereby improving operational efficiency and profitability (Orshi et al., 2026). Similarly, human capital efficiency has been found to positively influence bank performance in several contexts, although some studies report mixed or lagged effects, indicating that its impact may vary over time and across institutional environments (Tran & Vo, 2018; Xu et al., 2019; Haris et al., 2019; Berhe, 2025). These findings underscore the importance of developing and managing human capital as a strategic asset in achieving sustained profitability.

Structural capital, which encompasses organizational processes, systems, and knowledge infrastructure, also plays a significant role in enhancing firm performance (Soriya & Narwal, 2015; Yaseen & Al-Amarneh, 2021; Marsintauli et al., 2023). Efficient structural frameworks facilitate knowledge retention, improve internal processes, and support innovation, thereby contributing to profitability (Mustafa et al.,

2024; Haddad et al., 2023). However, empirical findings on the impact of structural capital remain inconsistent, with some studies reporting insignificant or even negative effects on profitability, suggesting inefficiencies in organizational systems and the need for better optimization (Haris et al., 2019; Dumah & Gaywala, 2025; Shiue & Elvina, 2025).

Relational capital, which captures the quality of a firm's relationships with customers, regulators, suppliers, and other key stakeholders, has emerged as a critical component of capital management in financial services firms, as it enhances customer loyalty, strengthens market reputation, and facilitates access to valuable external resources that support profitability and long-term sustainability (Shiue & Elvina, 2025; Zafar & Yasin, 2025; Haddad et al., 2023; Xu et al., 2019; Weqar et al., 2020; Mustafa et al., 2024; Campanella et al., 2023; Kusi et al., 2025; Yaseen & Al-Amarneh, 2021; Dumah & Gaywala, 2025). Empirical evidence further suggests that effective relational capital management contributes to improved financial performance and market value by fostering trust, reducing transaction costs, and enhancing firms' ability to compete in dynamic and highly regulated environments, although its impact may vary depending on how efficiently such relationships are leveraged for value creation (Tran & Vo, 2018; Haris et al., 2019; Le & Nguyen, 2020; Berhe, 2025; Soriya & Narwal, 2015).

Capital employed efficiency, which represents the effective utilization of financial and physical resources, remains one of the key determinants of profitability in financial institutions with consistent impact (Tran & Vo, 2018; Xu et al., 2019; Yaseen & Al-Amarneh, 2021; Orshi et al., 2026). Empirical studies consistently show that efficient use of capital employed significantly enhances profitability by improving resource allocation and operational performance (Le & Nguyen, 2020; Berhe, 2025; Barak & Sharma, 2023). Nonetheless, some studies report negative or insignificant relationships, indicating that inefficient capital allocation may adversely affect firm performance (Mawutor et al., 2023; Dumah & Gaywala, 2025). This highlights the need for financial institutions to adopt optimal capital management strategies to maximize returns.

Beyond the traditional components of intellectual capital, recent studies have emphasized the growing importance of innovation and technological capabilities in shaping firm profitability (Campanella et al., 2023; Altheebeh et al., 2025). The rapid adoption of financial technology (FinTech) and artificial intelligence has transformed the financial services landscape, leading to increased capital intensity and greater reliance on highly skilled human capital (Campanella et al., 2023). These technological advancements enhance operational efficiency, improve service delivery, and ultimately contribute to higher profitability (Altheebeh et al., 2025). Consequently, innovation capital has emerged as a critical component of modern capital structures in financial institutions.

Despite the extensive body of literature on capital and firm performance, existing studies have largely focused on developed and emerging markets outside Nigeria, with limited empirical evidence on the combined effects of different capital components on profitability within the Nigerian financial services sector as Orshi et al. (2026) focused only on listed banks. Moreover, prior studies often examine individual components of intellectual capital in isolation or the integrated value (Zafar & Yasin, 2025;

Mustafa et al., 2024); thereby neglecting the interactive and combined effects of multiple capital dimensions on firm profitability. In addition, mixed findings across studies suggest that the relationship between capital and profitability may be context-specific, influenced by institutional, regulatory, and economic factors (Haris et al., 2019; Xu et al., 2019; Mawutor et al., 2023).

Taken together, these observations point to an unresolved theoretical tension rather than a mere absence of local evidence. The resource-based view predicts that intellectual-capital resources should enhance firm performance, yet the empirical record is markedly inconsistent, and this inconsistency is seldom explained beyond vague appeals to context. At the same time, the regulatory framework, arguably the most binding institutional force in a bank-based financial system, is typically relegated to a control variable rather than modelled as a condition that governs whether capital investments translate into performance. Against this backdrop, this study examines the effect of capital management on the interest-income performance of listed financial-services firms in Nigeria and, more importantly, tests whether the regulatory framework (capital adequacy) moderates that relationship, thereby offering a theory-driven account of why the capital-performance link varies across settings.

Contribution of the Study

This study advances the literature in four ways. Theoretically, it integrates the resource-based view with regulatory capital framework theory to develop a contingency perspective in which the performance value of intellectual-capital resources depends on the prudential-regulatory regime in which they are deployed; this reconciles the conflicting positive, negative, and insignificant effects reported across prior studies. Empirically, it provides recent evidence (2012 to 2024) from the listed financial-services sector of Sub-Saharan Africa's largest economy, moving beyond the banking-only samples that dominate existing African research to encompass a broader set of financial institutions. Methodologically, it treats the regulatory framework as a moderator rather than a control, using interaction terms between the capital-adequacy ratio and each capital component to isolate how prudential regulation strengthens, weakens, or reverses the effect of specific resources, an approach rarely applied in emerging-market settings. For policy and practice, it offers regulators and managers granular, component-level evidence on which capital investments are complementary to, and which are constrained by, capital-adequacy requirements, informing both the calibration of prudential rules and firm-level resource-allocation decisions.

2.0 Literature review

Under this section, the underlying theories and the past related studies were reviewed.

Theoretical Framework

Resource-Based View (RBV) Theory and Regulatory Capital Framework Theory were adapted for this study. Resource-Based View (RBV) Theory, first proposed by scholars like Jay Barney (1991) and further developed by economists like Edith Penrose (1959), suggests that companies gain and maintain a

competitive advantage by obtaining and controlling valuable, scarce, unique, and non-substitutable resources. The significance of firm-specific resources in promoting growth and competitive advantage was underscored by Ogachi et al. (2020). Resource-Based View (RBV) theory posits that internal resources have a more significant role than external circumstances in attaining long-term success and preventing failure (Horobet et al., 2021). It is foundational for analyzing how financial services firms' internal resources and capabilities impact its ability to avoid corporate failure. The RBV emphasizes that firms with valuable, rare, inimitable, and non-substitutable resources are better positioned to achieve a competitive advantage and sustain superior performance. In the context of financial services firms, RBV highlights the importance of capital management practices as strategic resources that can enhance operational efficiency and financial stability. Effective capital management, which includes the strategic allocation and utilization of financial and human resources, is crucial for financial services firms' resilience against financial distress and regulatory pressures by focusing on how financial services firms leverage their unique resources, such as advanced risk management systems, proprietary financial technologies, and skilled personnel, the RBV provides insight into how these capabilities contribute to effective capital management and, ultimately, to corporate failure avoidance (Le et al., 2022; Sharif & Rouf, 2022).

Regulatory Capital Framework Theory complements the RBV by providing a structured perspective on how external regulatory requirements shape financial services firms' capital management strategies and their ability to avoid failure. This theory, commonly known as the Basel Accords, was developed and propounded by the Basel Committee on Banking Supervision (BCBS).It outlines how regulatory frameworks, such as Basel III, establish minimum capital requirements and risk management standards to ensure financial stability by focusing on the regulatory environment, this theory underscores the importance of compliance with capital adequacy norms and liquidity requirements (Eko & Ratih, 2024). It explains how adherence to these regulatory standards helps financial services firms mitigate risks associated with insufficient capital and financial instability. Regulatory Capital Framework Theory highlights that effective regulatory frameworks not only mandate capital reserves but also guide banks in adopting prudent capital management practices that enhance their resilience against economic shocks (Erland et al., 2024). This theory is crucial for understanding how regulatory capital requirements directly influence financial services firms' strategies to prevent corporate failure.

These theories provide comprehensive theoretical bedrock for analyzing the effect of capital management and regulatory frameworks on profitability in financial services firms. The RBV Theory offers insights into the strategic management of internal resources and capabilities, while the Regulatory Capital Framework Theory provides a lens for understanding the impact of external regulatory pressures on capital management practices.

Empirical Review and Hypotheses Development

Empirical evidence on the relationship between capital management, particularly intellectual capital, and profitability of financial institutions reveals a growing consensus on its strategic importance, although

findings remain inconsistent across the globe and institutional environments. A substantial number of studies provide evidence of a positive and significant relationship between intellectual capital and profitability. For instance, Shiue and Elvina (2025) found that extended value-added intellectual capital significantly enhances bank performance, even though some components such as innovation capital may negatively affect profitability. Similarly, Orshi et al. (2026) reported that intellectual capital significantly improves the profitability of Nigerian banks. Supporting these findings, Le et al. (2022) documented a positive association between intellectual capital and bank efficiency, which translates into improved profitability outcomes. Evidence from Berhe (2025), Mustafa et al. (2024), and Nguyen and Lu (2024) further confirms that human capital efficiency and capital employed efficiency significantly drive financial intermediation and profitability in banking and financial service firms.

In the same vein, several cross-country and meta-analytic studies reinforce the positive contribution of capital management to firm performance. Zafar and Yasin (2025), through a meta-analysis, established a statistically significant positive relationship between intellectual capital and financial performance, with human capital showing the significant influence on return on assets and return on equity. Similarly, Weqar et al. (2020) and Barak and Sharma (2024) found that intellectual capital components significantly enhance profitability and operational efficiency in banks. Earlier empirical works, such as Yalama (2013) and Soriya and Narwal (2015), also demonstrated that intellectual capital improves profitability, productivity, and overall financial performance of banking institutions. Furthermore, studies by Haris et al. (2019) and Xu et al. (2019) highlight that capital employed efficiency and human capital efficiency are particularly important in explaining variations in bank profitability across emerging markets. Complementing this evidence, Aziz et al. (2022) showed that structural capital efficiency and relational capital efficiency are key drivers of Islamic bank performance, while Putri et al. (2022) confirmed that intellectual capital significantly enhances financial performance, even though technological investments may not always yield immediate returns.

Notwithstanding the dominant positive evidence, some studies report mixed or even negative relationships between certain components of intellectual capital and profitability. For example, Shiue and Elvina (2025) observed that human capital efficiency and capital employed efficiency may negatively affect profitability while improving market value. Similarly, Mawutor et al. (2023) found that although overall intellectual capital improves performance, capital employed efficiency may negatively influence profitability in Sub-Saharan Africa. Dumah and Gaywala (2025) also reported a negative relationship between capital employed and firm performance, despite positive contributions from human and structural capital. In addition, Sharif and Rouf (2022) found that while human capital efficiency and capital employed efficiency significantly influence bank performance, structural capital efficiency may be insignificant. Likewise, innovation-related investments may not immediately translate into profitability due to high initial costs and delayed returns (Putri et al., 2022; Olajide, 2023). These inconsistencies suggest that the impact of capital management on profitability depends on contextual factors such as efficiency levels, institutional quality, and market structure.

Further empirical studies emphasize the role of specific components of capital management in influencing profitability. Human capital has been widely recognized as a critical driver of profitability due to its role in enhancing innovation, decision-making, and operational efficiency (Haris et al., 2019; Weqar et al., 2020; Berhe, 2025). However, Aziz et al. (2022) found that human capital efficiency may exert a negative effect on performance in certain contexts, suggesting inefficiencies in resource utilization. Structural capital, which reflects internal processes and systems, has shown both positive and insignificant effects, depending on institutional efficiency (Le et al., 2022; Sharif & Rouf, 2022). Relational capital, which captures customer and stakeholder relationships, has also produced mixed outcomes; while it enhances performance and market value in some cases (Aziz et al., 2022; Iazzolino et al., 2018), it may weaken performance when associated costs outweigh benefits (Chu et al., 2020). Capital employed efficiency consistently emerges as one of the pronounced predictors of profitability across studies (Nguyen & Lu, 2024; Barak & Sharma, 2024; Orshi et al., 2026), highlighting the importance of efficient utilization of financial and physical resources.

Beyond direct relationships, recent literature highlights the importance of moderating variables, particularly regulatory and institutional frameworks, in shaping the capital–profitability nexus. Angelo et al. (2021) demonstrated that prudential regulations such as Basel III and EMIR significantly influence financial markets by constraining balance sheet activities and altering interest rate dynamics, thereby affecting income generation channels of financial institutions. Similarly, Bashar et al. (2024) found that capital adequacy and regulatory conditions significantly influence bank profitability and the effectiveness of income-generating activities. Sohel and Barry (2024) further revealed that regulatory environments shape banks' revenue structures, risk exposure, and profitability outcomes, with less stringent regulations enhancing income diversification and performance.

At the institutional level, Adeleye (2024) showed that institutional quality moderates the effect of human capital on economic outcomes, indicating that governance structures play a crucial role in determining how effectively human capital translates into performance. Likewise, Nguyen et al. (2023) found that moderating factors such as income diversification can either strengthen or weaken the relationship between intellectual capital and bank performance. Eko and Ratih (2024) also reported that revenue diversification moderates the intellectual capital–performance relationship, reinforcing the importance of contextual and regulatory conditions. These findings suggest that regulatory frameworks and institutional quality are critical in determining whether investments in capital components yield positive profitability outcomes.

Three gaps emerge from this review. First, although the resource-based view predicts that intellectual capital enhances performance, the evidence remains markedly inconsistent, with positive, negative, and insignificant effects reported for the same components; this heterogeneity is rarely theorised and is instead attributed, after the fact, to unspecified contextual or institutional factors. Second, the regulatory environment, the most binding institutional force in bank-based financial systems, has largely been treated as a control variable or descriptive backdrop rather than as a boundary condition. Regulatory capital framework theory implies that capital-adequacy requirements actively reshape how firms deploy

human, structural, relational, innovation, and capital-employed resources, yet this moderating logic remains largely untested, particularly in emerging economies. Third, evidence from Nigeria, Sub-Saharan Africa's largest financial market, is thin and fragmented: existing studies examine banks in isolation, measure individual capital components separately, and stop at direct effects, without integrating the broader financial-services sector or modelling regulatory contingencies. This study addresses these gaps by jointly modelling five capital-management components and specifying the regulatory framework (capital adequacy) as a moderator, thereby providing a theory-driven explanation for the mixed findings that characterise the literature.

Based on the mixed empirical findings and the identified gaps, there is a need for further investigation into how capital management influences profitability within the Nigerian financial services sector, as well as how regulatory frameworks may condition this relationship. Therefore, this study hypothesizes that:

H01

Capital management has no significant effect on profitability of financial services firms listed in Nigeria.

H02

Regulatory framework does not significantly moderate the effect of capital management on profitability of financial services firms listed in Nigeria.

3.0 Methodology

Expost facto research design was adopted for the study because historical data were used without being subjected to any manipulation. The population of the study comprise 50 financial services firms listed on the Nigerian Exchange limited as at December 31, 2024, while 22 were selected as sample based on the accessibility to relevant data for the study. Secondary data, covering a period of 12 years, extracted from the annual reports and accounts of the sampled firms were used. The data source was adjudged valid and reliable as published financial statements of the financial services firms had been audited by the external Auditors, and approved for general usage by the regulatory bodies like the Nigerian Stock Exchange, Central Bank of Nigeria, Corporate affairs Commission and Financial Reporting Council of Nigeria.

Model specification

The regression models for this study was adapted from the study of Orshi et al. (2020) who investigates the relationship between intellectual capital (IC), staff development, and profitability in the Nigerian banking sector. Their study models were specified as:

$ROA = \beta 0 + \beta 1HCE + \beta 2CEE + \beta 3SCE + \beta 4LEV + \beta 5FSIZ + \varepsilon$ ..... (1)

$ROA = \beta 0 + \beta 1VAIC + \beta 2LEV + \beta 3FSIZ + \varepsilon$ ..... (2)

$ROA = \beta 0 + \beta 1VAIC + \beta 2STE + \beta 3STE*VAIC + \beta 4LEV + \beta 5FSIZ + \varepsilon$. (3)

Where:

The dependent variable, profitability is proxied by return on assets (ROA); the independent variable, intellectual capital is measured by human capital efficiency (HCE), capital employed efficiency (CEE), and structural capital efficiency (SCE) and total integrated capital (VAIC). They moderated their study by staff development, is proxied by the total STE (staff training and education) costs, while leverage (LEV) and size (FSIZ) were used as control variables.

While the study of Orshi et al. (2026) proxied profitability by return on asset, this study measured profitability using Interest Income Index; also, Orshi et al. (2026) capitals were human, capital employed, structural and total integrated while this study capital components are human, relational, capital employed, innovative, and structural. In addition, Orshi et al. (2020) used staff training and education cost as moderating variable, this study incorporated regulatory framework (capital adequacy) as moderating variable.

Therefore, this study developed regression models as:

$III_{it} = \beta_0 + \beta_1 HCM_{it} + \beta_2 RCM_{it} + \beta_3 CEM_{it} + \beta_4 ICM_{it} + \beta_5 SCM_{it} + \varepsilon_{it}$ ---------- (1)

$III_{it} = \beta_0 + \beta_1 HCM_{it} + \beta_2 ICM_{it} + \beta_3 RCM_{it} + \beta_4 SCM_{it} + \beta_5 CEM_{it} + \beta_6 CAR_{it} + \beta_7 HCM*CAR_{it} + \beta_8 ICM*CAR_{it} + \beta_9 RCM*CAR_{it} + \beta_{10} SCM*CAR_{it} + \beta_{11} CEM*CAR_{it} + \varepsilon_{it}$ ---------- (2)

Where:

III - Interest Income Index (that is, co-variance of interest income) computed as (standard deviation of the current year interest income and a year lagged interest income) divided by (mean of the current year interest income and a year lagged interest income)

HCM - Human Capital Management = Natural logarithms of Employees benefits (Salaries and Wages)

ICM - Innovative Capital Management = Natural logarithms of Intangible assets

RCM - Relational Capital Management = Natural logarithms of Corporate Social Responsibility Expenses

SCM - Structural Capital Management = Natural logarithms of (Value added minus Employees benefits (Salaries and Wages)

CEM - Capital Employed Management = Natural logarithms of Total Capital employed

CAR - Regulatory Framework (Capital Regulation) = Total Capital employed divided by Total Asset ratio

Analytical Techniques

The study employs inferential analytical technique to examine the effect of capital management on the profitability of listed financial services firms in Nigeria, as well as the moderating role of the regulatory framework. Inferential analysis is conducted using panel regression techniques. The study utilizes a panel dataset of selected firms over a specified period, and estimates the relationship using Ordinary Least Squares (OLS) within a panel framework, considering Pooled OLS, Fixed Effects, and Random Effects models. The appropriate model is selected based on the Hausman test, supported by the Breusch and Pagan Lagrangian Multiplier test and the Chow (Testparm) test. Multicollinearity is tested using the Pearson Product Moment Correlation (PPMC) and Variance Inflation Factor (VIF), with thresholds of 0.8 and 10 respectively. The moderating effect of the regulatory framework is captured through an interaction term between capital management variables and capital adequacy ratio (CAR). To ensure robustness, diagnostic tests including the Breusch–Pagan test for heteroskedasticity, the Wooldridge test for autocorrelation, and the Pesaran test for cross-sectional dependence are conducted to validate the reliability and consistency of the regression estimates.

4.0 Results and Discussions

The results of the correlation and regression analyses conducted are presented in Tables 1 and 2 respectively.

Table 1: Results of the Correlation and Variance Inflation Factor (VIF) Analyses

Variable	III	HCC	ICC	RCC	CEE	SCC	VIF	1/VIF
III	1.000						—	—
HCC	0.096	1.000					6.020	0.166
ICC	0.120	0.730	1.000				2.990	0.334
RCC	-0.014	0.690	0.605	1.000			2.140	0.467
CEE	0.081	0.854	0.758	0.691	1.000		4.730	0.212
SCC	0.210	0.829	0.780	0.669	0.784	1.000	4.220	0.237
CAR	—	—	—	—	—	—	1.410	0.707
							Mean = 3.585	

Source: Authors' Computations (2026)

Interpretation of the correlation coefficients and VIF results

The results presented in Table 1 indicate that the pairwise correlations among the explanatory variables and the dependent variable (III) are generally low to moderate, suggesting absence of multicollinearity problem. Specifically, the correlation between interest income (III) and the capital components, human capital (HCC = 0.096), innovation capital (ICC = 0.120), relational capital (RCC = −0.014), capital

employed (CEE = 0.081), and structural capital (SCC = 0.210), are all relatively weak, implying that each variable exhibits a distinct relationship with interest income. Among the independent variables themselves, the highest correlation observed is between HCC and CEE (0.854), followed by HCC and SCC (0.829), and ICC and SCC (0.780). Although a few of these values slightly exceed the conventional threshold of 0.800 for Pearson correlation, indicating the possibility of moderate association, this did not imply unhealthy multicollinearity, especially when considered alongside the VIF results.

The Variance Inflation Factor (VIF) values further confirm the absence of serious multicollinearity concerns. All VIF values, HCC (6.020), CEE (4.730), SCC (4.220), ICC (2.990), RCC (2.140), and CAR (1.410), are well below the critical threshold of 10.0, while the mean VIF of 3.585 is also far below the acceptable limit. Correspondingly, the tolerance values (1/VIF) are all above 0.10, reinforcing that the explanatory variables do not exhibit excessive linear dependence. Based on the guidelines provided by Vittinghoff et al. (2011) and James et al. (2013), these results suggest that multicollinearity is not severe enough to bias the regression estimates or distort statistical inferences. Therefore, the variables can be reliably included in the regression model without compromising the validity of the analysis.

Table 2: Regression and Diagnostic Tests' Results

Without Moderating Variable

Linear Regression with Panel-Corrected Standard Errors (PCSEs)

Variables	Coefficient	Std. Err	Z	P>z	Overall R-squared: 0.31 W(5, 12) = 2267.70; Prob = 0.000 Diagnostic Tests: Hausman Test: Chi^2 (4) = 19.85; Prob = 0.001 Testparm test: F(12, 247) = 5.99; Prob = 0.0000 Pesaran CD Test = -1.939 Prob = 0.0525 Autocorrelation Test:F(1, 21) = 14.766; Prob = 0.001 Heteroskedasticity: Chi^2 (22) = 261.92;Prob = 0.0000
HCM	-0.025	0.005	-4.50	0.000	
ICM	-0.0002	0.002	-0.08	0.933	
RCM	-0.002	0.003	-0.88	0.381	
SCM	0.017	0.007	2.46	0.014	
CEM	0.009	0.005	2.03	0.042	
CONS	0.125	0.032	3.87	0.000	

With Moderating Variable

Variables	Coefficient	Std. Err.	z	P>z	Overall R-squared: 0.37 W(11, 274) = 2760.44; Prob = 0.000 Diagnostic Tests: Hausman Test: Chi^2 (4) = 23.44; Prob = 0.015 Testparm test: F(12, 247) = 4.31; Prob = 0.000 Pesaran CD Test = -2.130 Prob = 0.033 Autocorrelation Test:F(1, 21) = 12.963; Prob = 0.002 Heteroskedasticity: Chi^2 (22) = 890.20; Prob = 0.0000 ΔW(6, 12) = 356.68; Prob = 0.011 Δ R-squared = 0.06
HCM	0.055	0.018	2.98	0.003	
ICM	-0.009	0.007	-1.41	0.157	
RCM	-0.018	0.007	-2.58	0.010	
SCM	0.053	0.015	3.46	0.001	
CEM	-0.082	0.014	-6.00	0.000	
CAR	-0.370	0.307	-1.21	0.227	
HCMCAR	-0.173	0.024	-7.20	0.000	
ICMCAR	0.011	0.012	0.85	0.395	
RCMCAR	0.019	0.011	1.72	0.086	
SCMCAR	-0.066	0.019	-3.47	0.001	
CEMCAR	0.202	0.023	8.77	0.000	
CONS	0.270	0.168	1.61	0.108	

Dependent Variable: III	@5% significance level

Source: Authors' Computations (2026)

Interpretation of Regression Results

The result of the Hausman test, which evaluates whether Fixed Effects (FE) or Random Effects (RE) is more appropriate, produced a Chi-square value of 19.85 with a p-value of 0.001. Since this p-value is below the 5% significance level, the null hypothesis that RE is consistent is rejected. This indicates that differences between FE and RE estimates are systematic, and therefore the Fixed Effects model is preferred. The Testparm test was used to compare the FE model against Pooled OLS. The result returned an F-statistic of 5.99 with a p-value of 0.0000, indicating that the fixed effects are jointly significant which implies that the position of the Hausman result is supported and this fixed-effect is adjudged as the appropriate estimating technique for the study. The reliability of the FE model was assessed using additional diagnostics. The Pesaran Cross-Sectional Dependence (CD) test yielded a value of –1.939 with a p-value of 0.0525, showing marginal evidence of cross-sectional dependence among firms. The autocorrelation test showed an F-statistic of 14.766 with a p-value of 0.001, indicating the presence of serial correlation in the residuals. Similarly, the heteroskedasticity test recorded a Chi-square statistic of 261.92 with a p-value of 0.0000, confirming significant heteroskedasticity.

These results of the diagnostic tests show violations of assumptions regarding independence and homoscedasticity. Therefore, the study adopts the Panel-Corrected Standard Errors (PCSEs) under the FE model, which corrects for heteroskedasticity, autocorrelation, and contemporaneous correlation simultaneously, ensuring more robust statistical inference.

Regression Model

$III_{it} = \beta_0 + \beta_1 HCM_{it} + \beta_2 ICM_{it} + \beta_3 RCM_{it} + \beta_4 SCM_{it} + \beta_5 CEM_{it} + \varepsilon_{it}$

Restated With Coefficients

$III_{it} = 0.125 - 0.025HCM - 0.0002ICM - 0.002RCM + 0.017SCM - 0.009CEM$

HCM recorded a coefficient of –0.025 with a p-value of 0.000, indicating a negative and statistically significant effect on the Interest Income Index (III). This means that improvements in human capital, such as training, employee development, or managerial enhancement, lead to a decline in III for every 1percentage change in HCM, there would be a reduction in III by 0.025 percent. The significant negative effect suggests that human capital investments may increase personnel-related costs or require adjustment periods that reduce interest-based income in the short term. ICM recorded a coefficient of –0.0002 with a p-value of 0.933, indicating a negative but statistically insignificant effect on III. This means that innovation-related activities such as new technologies or process upgrades do not produce measurable changes in interest income during the period, possibly due to high upfront costs or long

innovation payback cycles. RCM produced a coefficient of –0.002 with a p-value of 0.381, indicating a negative but statistically insignificant effect on III; thus, relational capital expenditures indicating that corporate social responsibilities do not transform into increase in interest-based revenue.

SCM shows a coefficient of 0.017 with a p-value of 0.014, indicating a positive and statistically significant effect on III. This means that improving structural capital such as internal systems, organizational routines, operational processes, and workflow technologies by a percentage change would increases the interest income index by 0.017 percent. This result highlights that well-developed internal structures and efficient processes improve the firm's ability to generate interest income, possibly through increased operational efficiency and service delivery capacity. CEM has a coefficient of 0.009 with a p-value of 0.042, meaning it has a positive and statistically significant effect on III. A percentage change in CEM increases III by 0.009 percent; reflecting that effective utilization of capital resources such as fixed assets and long-term financial resources supports interest income growth. This suggests that firms that efficiently deploy their capital achieve improved revenue-generating capacity within interest-related operations. The constant term of 0.125, which is highly significant, indicates that when all capital management variables are held constant, the baseline interest income index is 0.125 percent. This reflects the inherent income-generating ability of the firms independent of capital management practices.

The model reports an overall R-squared of 0.31, meaning that 31% of the variation in the interest income index is explained by the capital management variables. This is a reasonable level of explanatory power for panel data involving firm-level performance indicators. The Wald Chi-square statistic of 2267.70 with a p-value of 0.000 confirms that all explanatory variables are jointly significant; indicating that capital management collectively influences III, even though individual variables vary in significance.

With the inclusion of Capital Regulation (CAR) as a moderating factor in the model, the selection of the most suitable panel estimation technique was guided by a set of diagnostic assessments. The Hausman test was first applied to examine whether the differences between the fixed effects and random effects estimators are systematic. The test produced a Chi-square statistic of 23.44 with a p-value of 0.015, which lies well below the 5% significance level. This result indicates that the differences in coefficients between the FE and RE estimators are non-random, thereby favouring the fixed effects specification. This conclusion was reinforced by the Testparm test, which evaluates the relevance of entity-specific effects relative to a pooled OLS structure. The Testparm statistic returned F(12, 247) = 4.31 with a p-value of 0.0000, confirming that fixed effects significantly improve the explanatory power of the model. The results of the diagnostic tests clearly suggest that the fixed effects estimator is the most appropriate approach for analysing the moderating influence of regulatory frameworks on capital management.

Other diagnostic checks were performed to assess the validity of the fixed effects estimation. The Pesaran test for cross-sectional dependence yielded a z-value of -2.13 with a p-value of 0.033, revealing that economic or regulatory shocks experienced by one firm are likely to spill over to others within the sample. Likewise, the Wooldridge test for autocorrelation resulted in F(1, 21) = 12.963 with a p-value of

0.002, indicating the presence of serial correlation in the residuals. The heteroskedasticity test also revealed significant non-constant variance across firms, with a Chi-square value of 890.20 and a p-value of 0.000. These findings collectively point to substantial deviations from the classical OLS assumptions of independence, homoscedasticity, and absence of serial correlation. To ensure valid inference under these conditions, the model was estimated with Panel-Corrected Standard Errors (PCSEs), which address all three violations simultaneously and generate more reliable standard errors for hypothesis testing in this moderated setting.

Regression Model

$$III_{it} = \beta_0 + \beta_1 HCM_{it} + \beta_2 ICM_{it} + \beta_3 RCM_{it} + \beta_4 SCM_{it} + \beta_5 CEM_{it} + \beta_6 CAR_{it} + \beta_7 (HCM \times CAR)_{it} + \beta_8 (ICM \times CAR)_{it} + \beta_9 (RCM \times CAR)_{it} + \beta_{10} (SCM \times CAR)_{it} + \beta_{11} (CEM \times CAR)_{it} + \varepsilon_{it}$$

Restated With Coefficients

$$III_{it} = 0.270 + 0.055HCM - 0.009ICM - 0.018RCM + 0.053SCM - 0.082CEM - 0.370CAR - 0.173(HCM \times CAR) + 0.011(ICM \times CAR) + 0.019(RCM \times CAR) - 0.066(SCM \times CAR) + 0.202(CEM \times CAR)$$

HCM records a coefficient of 0.055 ($p = 0.003$), indicating a positive and statistically significant effect on III. This means that investments in employee skills, training, and welfare significantly enhance interest income performance. The coefficient value of 0.055 implies that a percentage change in HCM leads to a 0.055 percent increase in III, confirming that increase in compensation and welfare packages of employees (human capital) contributes directly to improved interest-earning capacity of financial firms. The interaction coefficient –0.173 ($p = 0.000$) is negative and significant, meaning that when regulatory capital adequacy requirements interact with human capital investments, the combined effect reduces interest income performance. Comparing this with the positive main effect, the presence of CAR reverses the influence of HCM. The coefficient of –0.173 means that a percentage change in the interaction between HCM and CAR causes a 0.173 percent decline in III, showing that regulatory constraints weaken the beneficial effect of human-capital investments on interest income.

ICM has a coefficient of –0.009 ($p = 0.157$), which indicates a negative but insignificant effect on III. The coefficient value implies that a percentage change in ICM leads to a 0.009 percent decline in III. This suggests that innovation-related expenses such as technology upgrades and process innovations slightly reduce interest income, possibly because innovative investments often involve short-term costs that do not immediately raise interest-earning capacity. The interaction term 0.011 ($p = 0.395$) is positive but insignificant, implying that regulatory oversight slightly reverses the negative effect of innovation capital, but the change is not meaningful. The coefficient of 0.011 indicates that a percentage change in the interaction increases III by 0.011 percent, showing that regulation marginally supports innovative investments, although not significantly.

RCM records a coefficient of –0.018 (p = 0.010), showing a negative and significant effect on III. This means that increased spending on corporate social responsibilities reduces interest income. The coefficient of –0.018 implies that a percentage change in RCM results in a 0.018 percent decline in III, suggesting that relational investments may not translate directly into interest-based income in financial services firms. The interaction coefficient 0.019 (p = 0.086) is positive but marginally insignificant at the 5% level. This means that regulation slightly counteracts the negative effect of RCM. The coefficient value implies that a percentage change in the interaction increases III by 0.019 percent, but with the p-value of 0.086 which is greater than the chosen significant level of 5%, it implies that the moderating influence of CAR on relational capital is statistically insignificant.

SCM shows a coefficient of 0.0526 (p = 0.001), indicating a positive and significant influence on III. This means that improvements in processes, systems, and organizational structures significantly boost interest income performance. The coefficient of 0.0526 suggests that a percentage change in SCM increases III by 0.0526 percent, underscoring the importance of strong internal structures. The interaction coefficient –0.066 (p = 0.001) is negative and significant, indicating that regulatory oversight reverses and weakens the positive effect of structural capital. A percentage change in the SCM × CAR interaction leads to a 0.066 percent decrease in III, showing that compliance requirements may impose operational constraints that reduce the efficiency benefits associated with structural capital.

CEM has a coefficient of –0.082 (p = 0.000), which is negative and highly significant. This shows that larger levels of capital employed reduce interest income performance. The coefficient of –0.082 implies that a percentage change in CEM results in a 0.082 percent decline in III, indicating inefficient utilization of capital or dilution of income relative to asset size. The interaction coefficient 0.202 (p = 0.000) is positive and highly significant, indicating that CAR substantially moderates CEM. The coefficient of 0.202 means that a percentage change in the interaction increases III by 0.202 percent, suggesting that regulatory monitoring improves the effectiveness of capital employed and reverses its negative standalone effect.

CAR alone has a coefficient of –0.370 (p = 0.227), indicating a negative but insignificant effect on III. The coefficient implies that a percentage change in CAR reduces III by 0.370 percent, although the effect lacks statistical significance. This suggests that the regulatory requirement itself does not independently influence interest income; its influence is more meaningful through interaction terms.

The significant interaction effects particularly for HCM, SCM, and CEM demonstrate that the regulatory framework significantly reshapes the influence of capital management on interest income. The moderated model yields an overall R-squared of 0.37, indicating that 37% of the variation in III is explained by the variables and interaction terms. The Wald statistic W(11,274) = 2760.44; p = 0.000 confirms the joint significance of the model. The change in R-squared ($\Delta R^2 = 0.06$) shows that introducing the moderator improves model explanatory power by 6%. With $\Delta R^2 = 0.06$ and a significant joint Wald test, the study concludes that CAR provides significant moderation.

The overall explanatory power of the moderated model is reflected in the R-squared value of 0.338, indicating that 33.8% of the variation in interest income is accounted for by the model. The F-statistic of 5.34 with a p-value of 0.000 confirms that the model is jointly significant. Furthermore, the change-in-F statistic ($\Delta F = 2.82$; $p = 0.011$) and the increase in R-squared ($\Delta R^2 = 0.047$) demonstrate that the inclusion of the moderating variable substantially improves the model's explanatory strength. This confirms that regulatory frameworks play a meaningful role in shaping the relationship between capital management practices and interest income.

Comparative Analysis of the results

A comparison of the baseline model and the moderated model incorporating the regulatory framework (CAR) reveals important shifts in the effects of capital management components on the Interest Income Index (III) of listed financial services firms in Nigeria. In the baseline model, the explanatory power is moderate, with an overall R-squared of 0.31, indicating that the capital management indicators jointly explain 31% of variations in interest income. After introducing CAR and its interaction terms, the explanatory power improves markedly to 0.37, with a ΔR^2 of 0.06 and a statistically significant change-in-Wald test ($\Delta W = 356.68$; $p = 0.011$). This confirms that the regulatory framework provides additional explanatory value, consistent with a significant moderating role.

In the baseline model, Human Capital Management (HCM) shows a negative and statistically significant effect on interest income ($\beta = -0.025$; $p = 0.000$). This suggests that increases in staff expenses, training costs, or human capability development tend to reduce interest income, possibly due to short-term cost pressures outweighing productivity gains. However, when CAR was introduced, the direction of the HCM effect changes sharply: HCM becomes positive and significant ($\beta = 0.055$; $p = 0.003$). This reversal implies that under regulatory pressure, human capital investments become more effective in enhancing interest-generating activities. Yet, the interaction term HCM×CAR is negative and significant ($\beta = -0.173$; $p = 0.000$), indicating a negative moderation, meaning that although HCM improves interest income under regulation, the strength of this improvement diminishes as regulatory demands intensify.

The effect of Innovation Capital Management (ICM) is minimal in both models. In the baseline regression, ICM is statistically insignificant ($\beta = -0.0002$; $p = 0.933$), showing no meaningful contribution to interest income. In the moderated model, ICM remains insignificant ($\beta = -0.009$; $p = 0.157$), and the interaction ICM×CAR is also insignificant ($\beta = 0.011$; $p = 0.395$). This indicates that regulatory frameworks do not meaningfully amplify or constrain the effect of innovation-related investments on interest income, suggesting that innovation activities do not directly influence interest-based revenue in the short term.

Relational Capital Management (RCM) is insignificant in the baseline model ($\beta = -0.002$; $p = 0.381$), implying that relationship-based expenditures (e.g., marketing, customer management, partnerships) do not significantly affect interest income. However, in the moderated model, RCM becomes negative and significant ($\beta = -0.018$; $p = 0.010$), showing that under regulatory conditions, relational capital imposes a drag on interest income, likely due to compliance-driven constraints on customer acquisition or market

expansion activities. The interaction RCM×CAR is marginally insignificant (β = 0.019; p = 0.086) but suggests a weak positive moderation, regulation slightly offsets the negative effect of RCM, though not statistically significant.

Structural Capital Management (SCM) shows a positive and significant effect in the baseline model (β = 0.017; p = 0.014). This implies that investments in systems, procedures, risk management frameworks, and operational structures enhance interest income, likely by improving efficiency and operational resilience. In the moderated model, SCM remain positive and significant (β = 0.0526; p = 0.001). However, the interaction SCM×CAR is negative and significant (β = –0.066; p = 0.001). This means that although SCM improves interest income under regulatory frameworks, regulatory constraints reduce the magnitude of this positive contribution, likely reflecting compliance costs or structural realignments imposed by regulation.

Capital Employed Management (CEM) is positive and significant in the baseline model (β = 0.009; p = 0.042), indicating that efficient use of capital employed contributes to improved interest income. However, in the moderated model, CEM exerted significant negative effect (β = –0.082; p = 0.000). This suggests that under regulatory conditions, especially capital adequacy requirements inefficiencies in capital utilisation have much more severe consequences for interest income.

The interaction CEM×CAR is positive and significant (β = 0.202; p = 0.000), confirming the importance of the moderating effect: capital regulation counteracts the negative impact of inefficient capital utilisation, mitigating performance decline. This reflects the sensitivity of capital deployment to regulatory frameworks.

The comparative analysis clearly demonstrates that regulation substantially alters the dynamics between capital management components and interest income. In the baseline model under H07, only SCM and CEM show positive and significant contributions, while HCM exerts a negative influence. With the introduction of CAR under H08, these relationships shift, revealing that regulation can strengthen, weaken, or reverse the effects of specific capital management components. The significant increase in explanatory power ($\Delta R^2 = 0.06$) and the significant moderating coefficients confirm that the regulatory framework significantly moderates the relationship between capital management and interest income, leading to the rejection of H08. Likewise, the significance of multiple capital management components in both models supports the rejection of $H_0 7$.

Discussion of findings

The findings on the effect of capital management on the interest income index (III) reveal a nuanced relationship between internal resource investments and interest-generating capacity among listed financial services firms. Human capital management exerted a negative and statistically significant effect on interest income in the baseline model, suggesting that increased expenditure on employee training, development, and remuneration initially constrained interest-based revenue generation. This outcome aligns with the findings of Aziz et al. (2022), who documented a detrimental short-term impact

of human capital efficiency on bank performance in Islamic banks, and with Sharif and Rouf (2022), who observed that human capital investments can increase operating costs without immediately translating into income gains. It is further supported by Tran and Vo (2018), who found that human capital efficiency may reduce current profitability but improve future performance, and Haris et al. (2019), who reported non-linear effects of intellectual capital on profitability. Similarly, Barak and Sharma (2024) reported that human capital can exert mixed or even adverse effects on certain financial performance indicators, depending on institutional context. However, this result contradicts evidence from Le and Nguyen (2020), Xu et al. (2019), and Berhe (2025), who found that human capital efficiency positively enhances profitability and financial intermediation. Orshi et al. (2026) also emphasize that staff development strengthens the profitability impact of intellectual capital. The divergence suggests that, in the Nigerian context, human capital investments may involve longer gestation periods or inefficiencies that suppress short-term interest income.

Innovative capital management exhibited a negative but statistically insignificant effect on interest income, implying that innovation-related investments did not materially influence interest-based earnings during the study period. This finding is consistent with Putri et al. (2022) and Olajide (2023), who reported that technological and innovation investments often fail to yield immediate financial returns due to high initial costs and delayed payoffs. It also aligns with Campanella et al. (2023), who noted that digital transformation reshapes banking models but may not instantly translate into income gains, and Altheebeh et al. (2025), who emphasized that technological investments require complementary systems to enhance profitability. Conversely, the result diverges from Shiue and Elvina (2025), who found that innovation capital efficiency significantly influences bank performance, and Zafar and Yasin (2025), whose meta-analysis confirmed a positive relationship between intellectual capital components and financial performance. This suggests that contextual factors such as regulatory intensity, technological readiness, and market structure may explain the weak innovation–income linkage observed in this study.

Relational capital management was found to have a negative but insignificant effect on interest income, indicating that expenditures on customer relationships, partnerships, and corporate social responsibility did not significantly enhance interest-based revenue. This outcome aligns with Chu et al. (2020) and Iazzolino et al. (2018), who emphasized that relational capital does not always translate into immediate financial gains unless effectively monetized. It also finds support in Haddad et al. (2023), who noted that while relational and social capital contribute to long-term value, their short-term profitability effects may be limited. However, this finding contrasts with Shiue and Elvina (2025) and Zafar and Yasin (2025), who documented positive effects of relational capital on market value and financial performance, suggesting that Nigerian financial firms may not yet be efficiently converting relational investments into interest income streams.

Structural capital management showed a positive and statistically significant effect on interest income, underscoring the importance of efficient internal systems, processes, and organizational routines in enhancing firms' ability to generate interest-based revenue. This finding aligned with the reports of Nguyen and Lu (2024) and Le and Nguyen (2020), who found structural capital efficiency to be a critical

driver of financial intermediation and profitability. It also aligns with Soriya and Narwal (2015), who reported that structural capital significantly enhances bank performance, and Mustafa et al. (2024), who confirmed its positive influence on financial outcomes. Additionally, Weqar et al. (2020) emphasized that structural capital improves operational efficiency and productivity. However, some contrasting evidence exists, as Orshi et al. (2026) and Berhe (2025) noted that structural capital may not always significantly influence profitability due to inefficiencies in organizational processes. Nonetheless, the result reinforces the resource-based view that codified knowledge and internal systems constitute strategic assets that directly support income generation.

Capital employed management exerted a positive and significant influence on interest income, indicating that effective utilization of financial and physical resources enhances interest-earning capacity. This finding is consistent with Xu et al. (2019), who identified capital employed efficiency as the most important component of intellectual capital in driving bank performance across emerging markets. It also corroborates Tran and Vo (2018), who found that capital employed efficiency is a key determinant of profitability, and Haris et al. (2019), who reported its significant positive impact on financial performance. Further support is provided by Dumah and Gaywala (2025) and Yaseen and Al-Amarneh (2021), who emphasized the significant role of capital employed in enhancing profitability. However, contrasting evidence from Mawutor, et al. (2023) suggests that capital employed may negatively affect profitability under certain conditions, indicating that efficiency in resource utilization is critical. Overall, the finding confirms that financial resource optimization remains central to interest income generation.

When capital adequacy regulation was introduced as a moderating variable, the results demonstrated that regulatory oversight fundamentally reshaped the capital management–interest income relationship. Human capital management became positive and significant under regulation, indicating that adequate capital buffers enable firms to deploy human resources more productively. This moderation effect aligns with Hossain and Rana (2024), who found that governance and ownership structures enhance intellectual capital efficiency, and with Mustafa et al. (2024), who showed that institutional frameworks strengthen the performance impact of intellectual capital. The negative interaction between human capital and regulation suggests, however, that excessive regulatory constraints may limit flexibility, echoing the findings of Campanella et al. (2023) regarding structural shifts in banking models.

The interaction results further reveal that regulation significantly dampened the positive effects of structural capital while reversing the negative effects of capital employed management. This pattern is consistent with Altheebeh et al. (2025), who noted that regulatory and technological frameworks jointly influence profitability, and with Kusi et al. (2025), who showed that intellectual capital mitigates risk and enhances profitability under structured environments. The positive moderation of capital employed supports the view that regulation enhances discipline in asset utilization, thereby improving interest income outcomes. Conversely, the weakening of structural capital effects under regulation suggests that compliance costs and procedural rigidity may erode efficiency gains from internal systems.

The findings provide empirical evidence that capital management significantly influences interest income, but the direction and magnitude of these effects depend critically on regulatory context. While internal resources such as structural capital and capital employed enhance interest income directly, regulatory capital adequacy plays a decisive role in determining whether investments in human, structural, and financial capital translate into sustainable income gains. This evidence is consistent with the broader literature emphasizing the complementary roles of intellectual capital and regulation, as documented by Shiue and Elvina (2025), Zafar and Yasin (2025), Weqar et al. (2020), and Yaseen and Al-Amarneh (2021), and confirms that regulation fundamentally conditions the performance outcomes of capital management practices in financial institutions.

The findings revealed that the capitals jointly impacts interest income (reject H07) is consistent with the Resource-Based View (RBV), which posits that firm-specific resources such as human capital and structural systems enhance competitive advantage and performance (Barney, 1991; Ogachi et al., 2020). The moderated model where capital adequacy significantly alters the magnitude and direction of relationships reflects the regulatory capital framework, which suggests that capital requirements reshape lending behaviour and income generation dynamics. Agency Theory further explains the short-run negative effects of some capital components, as managerial decisions may prioritize long-term or non-interest activities over immediate income generation. Meanwhile, Dynamic Capability Theory supports the finding that firms capable of adapting to regulatory changes can reconfigure resources to sustain interest income (Teece et al., 1997). The study demonstrates that capital management and regulatory frameworks interact in complex ways to shape financial performance outcomes in Nigerian financial services firms.

5.0 Implications and Conclusions

Implication of findings

For the financial health of listed financial services firms, the findings indicate that the components of capital management have varied and sometimes contradictory effects on the interest income index of listed financial services firms in Nigeria. This has important implications for their overall financial stability. The positive and significant effects of structural capital management and capital employed management in the baseline model suggest that proper investment in systems, processes, and efficient use of capital resources enhances interest income. This means firms with strong structural frameworks and optimized capital deployments are more likely to remain profitable and competitive in interest-driven markets. However, the moderated model reveals a more complex financial reality: the interaction of regulatory pressures significantly changes these relationships. For instance, the reversal of capital employed management from a positive effect to a significant negative effect under regulatory conditions implies that inefficient or misaligned capital deployment becomes more financially damaging when regulatory oversight is strict. This raises concerns about the vulnerability of firms with weak internal capital processes, suggesting that their financial health could deteriorate quickly under tightening regulatory regimes. The findings imply that regulatory frameworks can both enhance and constrain

interest income performance, creating a financial environment in which operational efficiency and compliance readiness play an increasingly central role in sustaining healthy income flows.

For management and corporate governance, the results carry significant implications for management teams responsible for strategic planning, compliance, and resource allocation. The shift in the direction and significance of Human Capital Management (HCM) between the two models highlights how managerial decisions regarding personnel, skill development, and labour investment are deeply affected by regulatory conditions. The baseline model suggests that investments in human capital temporarily exert pressure on interest income, potentially due to cost burdens. Yet, the moderated model shows that these same investments become productive under regulatory scrutiny, although regulation also weakens their overall strength through negative moderation. This dual effect implies that management must navigate a delicate balance between regulatory expectations and internal human capital strategies.

Furthermore, the significant negative effect of CEM under regulation signals that managerial missteps in capital utilisation such as excess idle capital, inefficient asset allocation, or mismatched capital structures can have amplified negative implications for income generation. Therefore, the findings highlight a managerial environment in which efficiency, compliance alignment, and strategic resource balancing are critical determinants of performance. Management decisions that fail to anticipate regulatory interactions may expose firms to income instability and operational strain.

For investors and shareholders, the findings have direct implications regarding risk exposure, expected returns, and the stability of interest-related income streams. The variability in coefficient directions between the baseline and moderated models underscores that the performance of capital management indicators is highly sensitive to regulatory conditions. For investors, this means that profitability based on interest income may fluctuate significantly depending on how well a firm adjusts to regulatory demands. The negative moderated effect of CEM, for example, suggests that firms performing poorly in capital utilisation are likely to experience sharper declines in income under regulatory pressure, increasing investor risk.

At the same time, the positive role of structural capital indicates that investors may expect more stable income flows from firms with strong internal structures and operational capacity. The presence of significant moderation effects signals that investor confidence depends not only on the internal capabilities of a firm but also on how those capabilities interact with the regulatory environment. Thus, the findings imply a market environment where regulatory compliance and internal efficiency jointly determine the reliability of returns.

For the employees, the findings also have implications for employees, especially in roles directly linked to human capital enhancement, compliance processes, operations, and customer management. The negative effect of HCM in the baseline model suggests that human capital expenditures may reduce short-term interest income, potentially creating pressure on staffing decisions, compensation budgets, and training expenditures. However, the moderated model indicates that regulatory environments make human capital investments more valuable, reversing the negative effect. This means employees may

benefit from a regulatory environment that requires better-trained, more competent staff to meet compliance and operational standards. However, the significant negative moderation of HCM implies that regulatory pressure can increase performance expectations, monitoring intensity, and workload demands. Employees may therefore experience a more demanding work environment under regulation, with heightened expectations regarding accuracy, risk management, and compliance adherence. The implication is that while regulation enhances the strategic importance of human capital, it also introduces job-related pressures that reshape employee experience and workplace dynamics.

For customers and the external environment, the findings indirectly influence customers and external stakeholders who rely on the stability and financial soundness of listed financial institutions. For customers, the restructuring of capital utilisation under regulation can affect product pricing, interest rate offerings, and accessibility of credit. For example, the negative effect of CEM under regulatory pressure suggests that firms may respond by tightening lending conditions, increasing interest rates, or reducing credit availability to safeguard income stability. Also, the negative effect of Relational Capital Management (RCM) under regulation may imply weaker market engagement or reduced customer acquisition initiatives, potentially limiting customer outreach or relationship-building efforts. External stakeholders such as regulators, market analysts, and competitors may also interpret the findings as evidence that the health of the Nigerian financial services sector is tightly linked to regulatory stringency and internal efficiency. This understanding could influence regulatory revisions, industry benchmarking, or competitive strategies.

For the financial system and regulatory bodies, at the systemic level, the presence of significant moderation effects suggests that regulatory frameworks significantly shape the performance outcomes of capital management practices. This means the financial system operates within a regulatory environment that actively influences firm-level behaviour and financial outcomes. The significant moderating effects especially on CEM imply that regulation plays a corrective role, amplifying the negative consequences of inefficient capital use. This has broader implications for financial stability, as it suggests that regulation may contribute to reducing systemic risk by placing pressure on inefficient firms while rewarding efficient ones. However, it also implies that during periods of regulatory tightening, weaker firms may experience substantial financial stress, potentially leading to consolidation, restructuring, or market exit. Regulators may view these findings as validation of the importance of oversight, but also as indicators of potential unintended consequences, such as heightened volatility in interest income across the industry.

Conclusion and Recommendations

This study set out to examine the effect of capital management on the interest-income performance of listed financial-services firms in Nigeria and to test whether the regulatory framework moderates that relationship. The evidence shows that capital-management components jointly and significantly shape interest-income performance, but their individual effects are heterogeneous: structural capital and capital-employed management contribute positively, whereas human-capital management exerts a

negative effect in the baseline model. Introducing the capital-adequacy ratio and its interaction terms significantly increases the model's explanatory power and, more importantly, alters the pathways through which capital components affect performance, strengthening some, weakening others, and reversing at least one. These results support a contingency reading of the resource-based view: the performance value of intellectual-capital resources is not fixed but is conditioned by the prudential-regulatory regime, consistent with regulatory capital framework theory. The study's originality lies in this joint modelling of multiple capital components with the regulatory framework as an explicit moderator, offering a theory-consistent explanation for the mixed evidence that dominates prior research and extending it to the under-studied Nigerian financial-services sector.

Based on the findings, management of financial services firms should prioritize strategic optimization of capital management components to enhance the interest income index. Specifically, managers should strengthen Structural Capital Management and ensure efficient utilization of Capital Employed, as these variables were shown to positively influence interest income. Investments in Human Capital should be carefully balanced to maximize productivity without imposing short-term cost pressures that could erode interest margins. Furthermore, management should monitor Relational Capital initiatives, particularly under regulatory scrutiny, to ensure that customer relationship and CSR expenditures translate into tangible interest-generating outcomes rather than becoming a cost burden. Overall, a more integrated approach to capital management, aligning human, structural, and capital deployment strategies, is essential for sustaining higher interest margins.

Regulatory bodies, on the other hand, should design and enforce capital adequacy requirements that not only safeguard financial stability but also optimize the impact of capital management on interest margin performance. The evidence suggests that capital regulation can significantly moderate the effects of capital management, amplifying some positive contributions while constraining others. Regulators should therefore provide guidelines that enable firms to maximize the benefits of human and structural capital investments while mitigating inefficiencies in capital employed. Regular monitoring, reporting, and risk-based adjustments to CAR requirements can ensure that regulatory frameworks strengthen firms’ interest margins without imposing excessive operational burdens. By fostering a regulatory environment that complements efficient capital management, both internal performance and overall sector stability can be improved.

Limitations and Future Research

Several limitations qualify these findings and suggest avenues for further work. The study is confined to listed financial-services firms in Nigeria, so the results may not generalise to unlisted firms or to other institutional settings; comparative work across emerging economies would test the boundaries of the contingency argument advanced here. Performance is captured through an accounting-based interest-income measure, and incorporating market-based and risk-adjusted measures would provide a fuller picture of firm performance. The capital components are proxied by book-based expenditures rather than standard value-added efficiency coefficients, so future research could triangulate across

measurement approaches to establish the robustness of these effects. Finally, capital adequacy is only one dimension of a broader regulatory architecture; subsequent studies could model additional prudential and governance instruments and employ dynamic panel estimators to address the potential endogeneity between capital deployment and performance.

Declarations

Conflict of interest:

All authors declare that they have no conflicts of interest

Declarations on the Use of AI

In preparing this manuscript, the author(s) used an AI-based tool solely to copy-edit author-written text for language, grammar, and readability. The tool was not used to generate, draft, or create any original content, including the abstract, literature review, analysis, results, or conclusions. All content is the author(s)' own work, and the author(s) reviewed and take full responsibility for the final manuscript.

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Author Contribution

J.D.K. conceived and designed the study and developed the theoretical framework. J.D.K. and G.O.O. collected the data and performed the panel regression analysis. O.P.A. and C.G.A. reviewed the empirical results and interpretation. J.D.K. wrote the main manuscript text, and G.O.O., O.P.A., and C.G.A. revised it critically. All authors reviewed and approved the final manuscript.The initials, for reference:J.D.K. — Jerry Danjuma Kwarbai (corresponding author, per the asterisk)G.O.O. — Grace Oyeniyi OgundajoO.P.A. — Olabode Paul AremuC.G.A. — Chinedu Gandolph Ahannaya

Data Availability

Data from 22 financial-services firms listed on the Nigerian Exchange over 2012 to 2024

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