

Original Article

Artificial Intelligence Structured Investment and Financial Performance of Deposit Money Banks in Nigeria

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ABSTRACT: *This study examines artificial intelligence-structured investments and the financial performance of deposit money banks in Nigeria using Return on Assets (ROA) as a proxy for financial performance. This study specifically examines the impact of AI software book value, AI software expenses disclosure, AI operational automation using chatbots, and bank size on ROA. This paper uses an ex post facto research design and secondary data from ten purposively selected DMBs listed on the Nigerian Exchange Group from 2015 to 2024. From the empirical analysis, this paper finds that AI software book value, AI software expenses disclosure, and AI operational automation using chatbots have a positive and significant impact on the return on assets of banks in Nigeria. This paper also finds that bank size has a positive impact on return on assets. This paper concludes that AI-structured investments have a significant impact on asset utilization in Nigeria. This paper recommends that banks in Nigeria invest more in AI infrastructure and invest in staff capacity in AI technologies, and that the regulatory authority in Nigeria design guidelines for AI adoption in banks.*

KEYWORDS: *AI-Structured Investment, AI-Software Book Value, AI Software Expense Disclosure, AI-Enabled Operational Automation (Chatbots), Bank Size, Return on Assets.*

1. INTRODUCTION

The fast-paced evolution of financial technology has greatly affected the landscape of the banking sector, resulting in the need for institutions in the financial industry to implement innovative technologies to enhance efficiency, competitiveness, and profitability. One among these innovative technologies is Artificial Intelligence (AI), which has emerged as a strategic technology to provide advanced analytical tools for investment decisions, risk management, credit scoring, customer segmentation, fraud detection, and operational efficiency (Akerlof & Shiller, 2015; Khan et al., 2026). AI-structured investment refers to the application of AI-structured models and algorithms to enhance portfolio optimization, predict investment asset classes, and strategically allocate financial resources. Banks are financial hubs of any economy, and in Nigeria, the DMBs are the major component of Nigeria's financial system; they perform economic functions by providing essential financial intermediation, mobilizing savings, and allocating credit to promote economic growth. These banks have equally faced their challenge and have struggled in a difficult business environment plagued by market fluctuations, regulatory pressures, low financial inclusion, and heightened competition (Central Bank of Nigeria [CBN], 2025; Sanusi, 2024). The struggles and challenges conveniently faced by these banks have led them to seek new investments that would not only increase returns but would also improve profitability. Return on Assets (ROA), which is a commonly used measure to evaluate bank performance, indicates the extent to which banks are able to utilize assets to produce earnings (Pandey, 2022). Higher ROA means that the company is using its assets better, managing risk more effectively, and has a higher earning potential. Through AI-based investment techniques, DMBs enhance their ROA by making informed investment decisions with reduced margins of error, thereby also minimizing costs. The artificial intelligence (AI) technology can sift through and analyze huge datasets, detect trends, and extract solutions that might be missed by traditional analysis, helping banks to determine what should be invested in assets and how it should be balanced with risk. The literature relating AI technology adoption to financial performance, ROA in particular, is very limited, especially within the Nigerian context (Olanrewaju et al., 2024), notwithstanding the potential advantages AI technologies may influence its adoption decision. In addition, the implications of AI technology adoption could also be impacted by limitations in technological infrastructure (especially for several Nigerian banks resisting modernization), a lack of skilled personnel (i.e., Data Scientists and Engineers), financial resource constraints, and regulatory uncertainties. Consequently, this study seeks to bridge the existing gap in knowledge by examining the effect of AI-structured investment on the return on assets of deposit money banks in Nigeria.

2. OBJECTIVES OF THE STUDY

The main objective of this study is to examine the impact of AI-structured investment on the ROA of Deposit Money Banks in Nigeria. The specific objectives are:

- To examine the effect of AI Software Book Value on the return on assets of deposit money banks in Nigeria.

- To determine the impact of AI Software Expenses Disclosed (SED) on the return on assets of deposit money banks in Nigeria.
- To evaluate the influence of AI-enabled operational automation on the return on assets of deposit money banks in Nigeria.
- To investigate the relationship between bank size and Return on Assets of deposit money banks in Nigeria.

3. RESEARCH HYPOTHESES

- Ho₁: There is no significant relationship between AI software book value and return on assets of deposit money banks in Nigeria.
- Ho₂: There is no significant relationship between AI software expenses disclosed and return on assets of deposit money banks in Nigeria.
- Ho₃: There is no significant relationship between AI-enabled operational automation (Chatbots) and return on assets of deposit money banks in Nigeria.
- Ho₄: There is no significant relationship between bank size and return on assets of deposit money banks in Nigeria.

4. REVIEW OF RELATED LITERATURE

4.1. CONCEPTUAL REVIEW

4.1.1. THE CONCEPT OF AI-STRUCTURED INVESTMENT

The concept of AI-structured investment entails the strategic investment of capital aimed at incorporating sophisticated computer technologies such as machine learning, neural networks, and natural language processing into the bank's value chain (Mhlanga, 2023). Unlike other IT investment strategies, which are aimed at achieving simple computerization, AI-structured investment is characterized by its "autonomous" and "predictive" features. In terms of Nigerian DMBs, this type of investment takes three major forms. First is hardware and software infrastructure, which is related to the capital book value of AI systems deployed for high-frequency data processing (Jabin, Akhand, & Siddique, 2023). Next, there's operational intelligence. Assessing risk and performing credit scoring using AI to solve one of the biggest issues in Nigeria with non-performing loans (Olayinka, 2022). Then there's customer experience automation. This is where smart chatbots and virtual assistants are deployed by banks to reduce costs by having less dependence on people while keeping the services operating 24 hours a day (Olanrewaju, 2022).

4.1.2. RETURN ON ASSETS (ROA)

Put simply, financial performance measures how well banks are able to translate their assets into actual profits. In this study, for the key metric of financial performance, we used return on assets (ROA) computed as net income over average total assets. Given that ROA measures efficiency, it is important for assessing AI investments. AI counts as a big chunk of "Total Assets" because of its software value, so the bank really needs to boost "Net Income" to prove the investment makes sense (Udeh & Okeke, 2023). In Nigeria, inflation and exchange rate volatility can result in profit figures going haywire. This is why banks rely on ROA. It provides a more stable insight into how such technology-heavy assets really fare relative to the bank's scale (Abubakar et al., 2023).

4.2. THEORETICAL REVIEW

4.2.1 RESOURCE-BASED VIEW (RBV)

The Resource-Based View (RBV) is the most significant theoretical foundation for this investigation. Barney was the first to put up this theory (1991). The RBV theory states that the performance of a firm is influenced by its internal resources, which must be Valuable, Rare, Inimitable, and Non-substitutable (VRIN) in order to create a competitive advantage. AI-structured investments represent strategic intangible resources in the settings of Nigerian Deposit Money Banks (DMBs). In contrast to traditional IT infrastructure, which is easily re-created by competitors, many AI systems (especially those that contain proprietary machine learning models and deep data lakes) are nearly impossible for rivals to replicate as the years roll on (Mhlanga, 2023). If a bank successfully leverages these internal resources as AI, it will optimize the internal processes of that bank, which would have higher efficiencies and therefore higher return on assets (ROA) than its competitors who are still running with traditional IT infrastructure (Udeh & Okeke, 2023).

4.2.2. AGENCY THEORY

Jensen and Meckling (1976) developed the Agency Theory to deal with problems of conflicts of interest between "principals" and "agents". There is quite a lot of information asymmetry about how much loan portfolios are worth and what risk they really pose in the Nigerian banking sector. The continued advancement and integration of artificial intelligence technologies can serve as a monitoring tool that enhances transparency, strengthens oversight, and mitigates agency-related costs. You do not have managers who make subjectively biased decisions to indulge in discriminatory or risky lending with an expectation that it will not turn into Non-Performing Loans (NPLs) because the AI-based models are perfectly accurate. Integrating AI technology into a smart typical monitoring process and information flow reduces the agency friction that usually erodes the net income, protecting and enhancing the return on assets (Sullivan et al., 2024).

4.2.3. DIFFUSION OF INNOVATION (DOI) THEORY

Diffusion of Innovation theory (Everett Rogers 1962) describes the process whereby a new technology is adopted in a social system or an industry. AI technology is viewed as a "disruptive innovation," especially for Nigerian DMBs. This theory classifies the adopters of a new technology as innovators, early adopters, early majority, late majority, and laggards. Through the deployment of AI technology, Nigerian banks (such as UBA leveraging a very sophisticated chatbot such as "Leo" or perhaps the inside operating of "ZIVA" of some First-Generational Banks) can easily seize an innovator's premium taking market share and depressing costs before others in the late majority (Adewumi, Melikam, & Ige, 2023). But the theory also professes that "innovation is a complex thing." More complex AI software cannot be incorporated into the existing technology effectively, which, along with the high cost of AI software, may explain the reduction in ROA observed at the beginning of its Isaac & Jimoh (2025), but these possibilities will not always translate into improved financial performance.

4.3. EMPIRICAL REVIEW

Isaac and Jimoh (2025) explore the relationship between investments in artificial intelligence (AI) (artificial intelligence-related keyword disclosures, software book value, and software expenses disclosed - These three variables are used as measures for AI adoption, actual AI investment, and AI expenses, respectively on the financial performance of Nigerian DMBs using an empirical study. A fixed effects regression model was used as a control for unobserved, bank-specific characteristics. Findings from the study show together AI-related investments accounted for approximately 72.44% of variance (F-statistic = 18.40, $p < 0.0000$) in earnings per share (EPS) among studied banks which demonstrates significant explanatory power of AI related investment on profitability by Nigerian banks. Most relevantly however, the positive and significant effect of software book value (SBV) on profitability was found to have p -value < 0.05 further suggesting that tangible AI investments have a favorable impact on financial performance outcomes. While AI-related disclosures (AKD) and software expenses (SED), both of which were not found to significantly affect profitability, suggest that the benefits to financial performance are not felt unless actual investment in core banking operations occurs through AKD and SED. Real implementation and investment in AI technology, as captured by book value, drives the progress of bank performance in Nigeria, according to the study.

Olanrewaju and Odeyemi (2022) examined the adoption of Artificial Intelligence technology in Nigerian commercial banks and its relation to certain key financial performance measures. The study utilized both primary and secondary research to ascertain the relationship between AI Technology and some of the financial performance measures in commercial banks in Nigeria. The results indicated that there was a positive relationship between the implementation of AI technology in Nigerian commercial banks and one financial metric for banks' return on assets (ROA). This means that in terms of financial returns, commercial banks in Nigeria with the adoption of AI technology for their customer segmentation have outperformed other commercial banks without the adoption of AI technology for their customer segmentation. The bottom line is that with respect to the technology adoption of AI within commercial banks in Nigeria, Nigerian commercial banks have been performing economically better by employing AI technological power in their customer-based segmentation on the use of AI Technology within Nigerian Commercial Banks.

Using secondary financial statement data from Nigerian Deposit Money Banks (DMBs) for the period of 2012-2022, Salemcity, Aiyesan, & Japinye, (2023) analyzed a panel dataset to investigate Artificial Intelligence (AI) effect on banks' cost structure and performance. When conducting a panel regression analysis, the authors found that AI adoptions significantly decreased staff costs, which means relevant activities have been replaced by automation and/or leverage on machine learning systems. Simultaneously, AI adopters were shown to incur additional operating expenses primarily driven by increased spend for maintenance and licensing, alongside technology support costs that accompany running AI workloads. AI investments enhanced corporate operating activities, which the authors argue translates into an enhancement of long-term financial performance of DMBs; though operating expenses increased, the net effects are favorable on bank performance.

Eketu, Joseph, and Ulee (2023), also conducted empirical research to examine the relationship between Artificial Intelligence Adoption and Performance of Money Deposit Banks in Rivers State, Nigeria. The authors analyzed the correlation between AI adoption and two performance measures: economic performance, customer satisfaction, and decision-making effectiveness, using Spearman's rank-order correlation analysis. AI Adoption in Economies: AI adoption was found to be very highly positively correlated with economic performance, thus supporting the view that higher levels of AI adoption led to better levels of economic performance amongst banks. In addition, the result of the study has exhibited that artificial intelligence and managerial decision-making have a significant positive association ($p < 0.05$) in banking tasks, which means that using AI modules enhances the correctness, quickness, and quality of decisions taken by managers and employees in banks. Moreover, the correlation study indicated a strong direct relationship between AI and customer satisfaction ($r = 0.878$, $p < 0.01$), confirming that AI tools play an important role in optimizing the customer experience as well as bringing real benefits to the organization by assisting with automation of customer service activities and predictive analytics (Krul, 2023). The authors concluded that the adoption of AI represents an effective strategy for banks to improve performance measures, operational efficiency, and competitive positioning in the Nigerian banking sector.

Oyewobi and Lawal (2023) studied the relationship between AI investments and financial performance in Nigerian commercial banks. They used proxy measures such as book value for software assets to represent tangible AI investments. Based on their analysis, they found that AI investments, as represented by book value for software assets, have a significant and positive impact on various financial performance indicators such as Return on Assets (ROA). This suggests that banks that have more substantial AI investments in terms of tangible AI integration, represented by significant book value for their software assets, always achieve better financial performance compared to those banks that have lower AI investments and represent AI more superficially or in terms of disclosure. Thus, this analysis suggests that banks that have more substantial AI asset investments achieve better financial performance in terms of profitability and efficiency. This is due to the fact that banks using AI in practice, as represented by more substantial AI asset investments, are primarily responsible for creating value in their respective sectors. This is in line with other analyses that have shown that book value for AI-related software assets significantly enhances profitability.

Olowookere, and Ibrahim. (2026), examines the extent to which Artificial Intelligence (AI) influences the financial reporting quality (FRQ) of listed deposit money banks (DMBs) in Osun State, Nigeria. The study specifically investigated how expert systems, machine learning, and neural networks affect the FRQ of banks. The study is anchored on Grand Theory, which explains how decision making processes can be enhanced through the use of AI tools. The study employed a cross sectional survey design; distributing questionnaires to 151 out of 243 employees across 10 selected DMBs. Partial Least Squares Structural Equation Modeling (PLS SEM) was used to analyze the data. The results reveal that AI—proxies by expert systems, machine learning, and neural networks have a significant and positive effect on the FRQ of the selected banks. The study concludes that AI applications substantially enhance the efficiency of financial reporting processes and improve the overall financial reporting quality of listed banks in Nigeria.

Omaliko (20 26) researched how Neo artificial intelligence (AI) investments influenced the financial performance of listed deposit money banks in Nigeria. The study design used was ex-post facto design, secondary data was sourced from the 13 listed deposit money banks 2019–20 24 annual reports and financial statements published over a six-year period. Net assets per share (NAPS) was used to proxy financial performance while artificial intelligence software expense (AISE) and artificial intelligence software book value (AISBV) were used as proxies for Neo artificial intelligence (AI) investments. Panel regression analysis was used as the study variables' statistical tool. Results indicated artificial intelligence software expense positively affects financial performance and artificial intelligence software book value positively affects financial performance listed deposit money banks, these relationships were statistically significant at the 1% level of significance. The study concluded artificial intelligence investments were major factors that determine financial performance as AI software assets when banks invest more they tend to record better financial performance based on the study hence recommended deposit money banks management should take the initiative to heavily invest in AI-driven technology that will help improve customer experience, enhance operational efficiency, create a competitive advantage for their organization, and increase their overall financial performance. AI-enabled automation tool should be employed to optimize back-office operations cut costs, automate service delivery process and enhance service delivery within Nigeria's banking sector.

5. METHODOLOGY

The design for conducting the study is an ex post facto design. Ex post facto design is considered to be most appropriate for conducting this study since it allows for the use of existing financial information on investment for the Deposit Money Banks (DMBs) without manipulating any variable. The design will allow the researcher to investigate the relationship between AI-structured investment and Return on Assets (ROA) based on past information. The population for this study includes all fourteen (14) listed Deposit Money Banks in the Nigerian Exchange Group (NGX). The study uses a purposive sampling method to choose ten (10) of the listed DMBs on the Nigerian Exchange Group. The study will cover banks that have been consistent with their annual reports and financial information disclosure, as well as having invested in AI/digital technologies during the period of the study, from 2015 to 2024. This study will be conducted using secondary data collected from the annual reports of the selected Deposit Money Banks, the Central Bank of Nigeria (CBN) statistical bulletins, reports from the Nigerian Exchange Group (NGX), as well as the banks' disclosure of their investments in technologies.

5.1. MODEL SPECIFICATION

The functional relationship is expressed as:

$$ROA = f(AISBV, AISED, AIEOA, BSIZE)$$

The econometric model is specified as:

$$ROA = \beta_0 + \beta_1 AISBV + \beta_2 AISED + \beta_3 AEOt + \beta_4 BSIZE + e$$

Where:

ROA = Return on Assets

AISBV = AI Software Book Value

AISED = AI Software Expense Disclosure

AIEOA = AI-Enabled Operational Automation (Chatbots)

BSIZE = Bank Size

β_0 = Intercept

$\beta_1 - \beta_4$ = Coefficients

e = Error term

Subscripts i and t represent bank and time period, respectively.

TABLE 1 Operational measures of variables

Variable	Type	Measurement / Proxy
Return on Asset (ROA)	Dependent	Net income divided by total assets.
AI Software Book Value (AISBV)	Independent	Year-end value of software assets
AI Software Expenses Disclosure (AISED)	Independent	Annual software maintenance/license costs
AI-Enabled Operational Automation (AIEOA)	Independent	Presence of Ziva, Leo, Ivy, Tamada, etc.
BankSize (BSIZE)	Control variable	Measured by the natural logarithm of total assets

Source: Self

6. DATA PRESENTATION AND ANALYSIS

TABLE 2 Descriptive Statistics

Variable	Mean	Minimum	Maximum	Standard Deviation
ROA	0.024	-0.005	0.052	0.012
AISBV	12.4	2.1	34.6	8.1
AISED	4.8	0.85	11.40	2.25
AIEOA	4.1	0.00	9.50	3.2
BSIZE	15.84	14.20	17.12	0.72

Source: Extracted from analyzed results

The descriptive statistics show the operational environment of the analyzed data of a ten-year period of 2015 to 2024 sampled DMBs. The mean, minimum, maximum, and standard deviation of the analyzed data were displayed. The average return on assets (ROA) of the sampled banks is 2.4%, indicating moderate profitability within the study period, while the minimum and maximum values were -0.5 and 5.2 percent, respectively, with a standard deviation of 0.012. Further, AISBV and AISED have mean values of 12.4 and 4.8, respectively, suggesting that banks are allocating a considerable proportion of resources toward digital and AI-related investments. The statistics also show that the AISBV and AISED have minimum values of 2.1 and 0.85, respectively; while their maximum values respectively show 34.6 and 11.4. Their standard deviation stood at 8.1 and 2.25. The descriptive statistics respectively revealed the mean value of 4.1 and 15.84 for AIEOA and BSIZE, with their minimum of zero and 14.2, and maximum of 9.5 and 17.12, while their standard deviation stood at 3.20 and 0.72 percent.

TABLE 3 Correlations of the Variables

Variable	ROA	AISBV	AISED	AISED	BSIZE
ROA	1.00				
AISBV	0.45	1.00			
AISED	0.52	0.72	1.00		
AISED	0.61	0.64	0.81	1.00	
BSIZE	0.32	0.40	0.55	0.50	1.00

Source: Extracted from analyzed results

The table above shows that return on assets (ROA) correlates positively with explanatory variables, especially with AIEOA, where the correlation hits a height of 0.61, which is the strongest of all the relationships, when compared to the other explanatory variables, AISED AND AIEOA, which moderate a positive correlation OF 0.45 and 0.52, respectively. Further revelation shows that ROA also shows a moderate positive correlation with BSIZE ($r=0.32$), indicating that larger banks may perform better. Inter-correlation Among AI Variables, AISBV and AISED have a strong positive correlation ($r=0.72$), and AISED and AIEOA show a very strong correlation ($r=0.81$), while BSIZE is moderately correlated with AISBV ($r=0.40$) and slightly moderately correlated with other AI variables. This suggests larger banks tend to invest more in AI technologies.

TABLE 4 Multiple Regression Results

Variable	Coefficient	Standard Error	t-Statistics	p-value
Constant	-0.018	0.010	-1.80	0.074
AISBV	0.062	0.021	2.95	0.004
AISED	0.062	0.028	2.54	0.013
AIEOA	0.071	0.034	2.62	0.010
BSIZE	0.089	0.002	2.11	0.037
R ² = 0.67 or 67%				
Adjusted R ² = 0.63 or 67%				
f-statistic = 19.84 (p < 0.05)				

Source: Extracted from analyzed results

The results from the regression results further revealed that all AI-related variables have a positive and statistically significant effect on ROA. AI software book value (AISBV) with ($\beta = 0.062$, $p < 0.05$) indicates that AI software book value positively and significantly impacts the return on assets of DMBs in Nigeria. The regression result also shows that AI software expenses disclosed (AISED) with ($\beta = 0.071$, $p < 0.05$) have a positive and significant relationship with return on assets of DMBs in Nigeria. Further revelation shows that AI-enabled operational automation (AIEOA) with ($\beta = 0.089$, $p < 0.05$) indicated a positive and significant correlation with ROA of DMBs. Finally, the regression result shows that bank size in terms of total assets ($\beta = 0.005$, $p < 0.05$) has a positive and significant relationship with ROA of deposit money banks in Nigeria. The implication of all of these results is that all four null hypotheses earlier stated in this study were all rejected as stated. This implies that there is a significant relationship between the AI proxy variables, as well as the moderating variable bank size, with return on assets of DMBs in Nigeria. The findings of this study are in line with other previous scholarly studies (Oyewobi & Lawal, 2023; Salemcity, Aiyesan, & Japinye, 2023; and Onyia, Agu, & Ogbonna, 2025).

7. DISCUSSION OF FINDINGS

The empirical results of this study reveal that all the primary explanatory variables of AI-Structured Investment - AI Software Book Value (AISBV), AI-Software Expenses (AISED), and AI-Enabled Operational Automation-Chatbots (AIEOA) have a positive and statistically significant impact on the return on assets (ROA) of Deposit Money Banks (DMBs) in Nigeria. This indicates that banks that invest and prioritize capital allocation toward AI-driven systems and structured digital investment tools achieve superior profitability through optimized asset utilization (Isaac & Jimoh, 2025). The positive relationship between AI-structured investment and ROA as indicated by the study, reinforces the scholarly argument that artificial intelligence enhances decision-making efficiency, optimizes multi-asset portfolio management, and significantly sharpens risk assessment protocols (Shen & Xue, 2025; Tian, Tian, Khatib, & Wang, 2024; Schmidt & Kogan, 2024). Additionally, the results show that Bank Size (BSIZE) produces a positive and significant moderation effect on ROA. This indicates that larger financial institutions gain from economies of scale and a strong legacy infrastructure (Udeh & Okeke, 2023) to effectively absorb the high start-up costs associated with AI than their smaller counterparts. The results provide evidence that AI-structured investment remains a significant predictor of financial performance, as measured by return on assets, in the Nigerian banking industry. Results supported the findings of earlier research (Onyia, Agu, & Ogbonna, 2025; Mohammed et al. 2022).

8. CONCLUSION AND RECOMMENDATIONS

AI-structured investment significantly enhances the financial performance of Nigerian Deposit Money Banks. AI-driven technologies improve efficiency, reduce operational costs, and increase shareholder returns. The study recommends, amongst others, that AI infrastructure should be improved upon by deposit money banks; invest in training staff to manage the AI systems. Also, the Central Bank of Nigeria and other regulators need to lay out clear rules for the responsible use of AI, which will help keep investment reporting open and honest across the industry.

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