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Effect of artificial intelligence investments on the performance of deposit money banks

Paul Adebayo Adejola, *Association of Chartered Certified System Accountants (ACCSA) Global*
padejole@yahoo.com

Jose Noguera, *Southeastern Louisiana University*, jose.noguera@selu.edu

Isaac Lambe, *Bingham University*, talk2ice@yahoo.com

Abstract

This study investigates the effect of artificial intelligence (AI) investments on the performance of deposit money banks (DMBs) in Nigeria. Using data from 14 listed DMBs over 11 years (2012-2022), we analyze the impact of AI investments, proxied by computer software expenses and computer software book value, on the return on equity (ROE). Our findings indicate that software expenses have an insignificant effect on ROE, while software book value has a significant negative impact. However, collectively, AI investments significantly affect the performance of DMBs. The study underscores the importance of AI in enhancing the efficiency and profitability of banks in Nigeria.

Keywords: Artificial Intelligence, Investments, Performance, DMBs, Nigeria

Introduction

Artificial Intelligence (AI) has become a transformative force across various industries, including banking. The integration of AI technologies in banking is not merely a trend but a strategic necessity driven by the need for enhanced efficiency, improved customer service, and robust risk management. AI technologies encompass a range of applications, such as machine learning, natural language processing, robotic process automation, and predictive analytics. These technologies enable banks to automate routine tasks, quickly process vast amounts of data, and gain previously unattainable insights. Nwala et al. (2020) examined the adoption of AI technologies in emerging markets and their impact on bank performance. The authors used a dataset of banks from several emerging economies, including Nigeria. They found that AI investments, particularly in machine learning and natural language processing, positively affected banks' ROE. The study emphasized the role of AI in enhancing customer engagement and reducing operational costs.

In Nigeria, the banking sector has been increasingly adopting AI to stay competitive and meet the evolving demands of the market. The shift towards digital banking, driven by technological advancements and changing customer preferences, has further accelerated the adoption of AI.

Omoruyi & Orobator (2022) explored the relationship between software investments and bank profitability. Focusing on Nigerian banks, the study used computer software expenses as a proxy for AI investments. The findings revealed that higher software expenses were associated with improved ROE, as these investments facilitated automation and better data management practices.

Chude (2015) evaluated the impact of technology investments, including AI, on the performance of banks in Nigeria. The study used total interest earned from primary banking activities as a control variable. The results showed that technology investments led to higher profitability and efficiency, with AI-driven initiatives playing a crucial role in enhancing operational capabilities and customer satisfaction. Oyewobi & Lawal (2023) studied the impact of AI on the financial performance of

Nigerian deposit money banks. Using the book value of software assets as a proxy for AI investments, the study found that AI significantly influenced banks' ROE. The research highlighted the importance of continuous investment in AI to maintain competitiveness and drive innovation in the banking sector. Investments in AI are seen as a strategic move to enhance the performance of deposit money banks (DMBs). These investments are reflected in various forms, such as computer software expenses and the book value of software assets. By investing in AI, Nigerian banks aim to improve their return on equity (ROE) and overall financial performance.

The primary objective of this study is to investigate the effect of artificial intelligence investments on the performance of deposit money banks utilizing the instrumentality of listed DMBs in Nigeria. The specific objectives are to:

1. examine the extent to which computer software expenses have affected the return on equity of listed deposit money banks in Nigeria.
2. ascertain the extent to which software book value has affected the return on equity of listed deposit money banks in Nigeria.

Given the foregoing, the basic hypothesis underlying this study is stated thus;

HO₁: Computer software expenses do not have any significant effect on the return on equity of listed deposit money banks in Nigeria.

HO₂: Computer software book value does not have any significant effect on the return on equity of listed deposit money banks in Nigeria.

Methodology

The research design utilized in this study is the ex-Post facto research design, which aims to describe past events, phenomena, or scenarios. It involves studying the past of a specific subject matter. The researcher believes that this research design is the most suitable for accurately depicting the relationship between variables and formulating hypotheses, leading to valid decisions and conclusions based on the findings.

For this study, the population consists of the 21 deposit money banks listed on the Nigerian Exchange Group as of December 31, 2022, under the class of deposit money banks. The study utilized the purposive sampling technique to select a sample of fourteen (14) deposit money banks. The purposive sampling technique was applied based on the accessibility of the information over the examination period, and the use of listed deposit money banks is considered expedient based on the accessibility and unwavering quality of information, as they are lawfully expected to give financial reportage of their result of operations on an annual basis. The secondary source of data, covering a time of eleven years (2012-2022), was equally utilized in order to guarantee the homogeneity and progression of the data collected.

The Econometric Views 12 was utilized as the statistical tool for the data analysis, with regression analysis serving as the foundation for hypothesis testing. To carry out the analysis, the following model, adapted from Shehu (2015), was utilized to examine the data:

$$ROE_{it} = \beta_0 + \beta_1 SE_{it} + \beta_2 SBV_{it} + \beta_3 REV_{it} + e_{it} \dots\dots\dots (i)$$

Where:

- ROE= Return on Equity
- SE= Software Expense
- SBV = Software Book Value
- RV = Revenue

Table 1: Measurement of Variables

| S/N | Proxy | Type | Measurement | Source |
|-----|---------------------|-------------|---|---------------------------|
| 1 | Return on Equity | Dependent | Profit after tax + total equityx100 | Nongomin (2022) |
| 2 | Software Expense | Independent | Total annual company software expense | Omoruyi & Orobator (2022) |
| 3 | Software Book Value | Independent | Annual closing book value of software assets | Oyewobi & Lawal (2023) |
| 4 | Revenue | Control | Total interest earned from primary banking activities per annum | Chude & Chude (2015) |

Result and Discussion

Table 4.2 presents correlation values among dependent and independent variables and the correlation among the independent variables.

Table 2: Correlation Analysis Result

| Correlation | ROE | SE | SBV | REV |
|--------------------|-----------|----------|-----------|----------|
| Probability | | | | |
| ROE | 1.000000 | | | |
| | ----- | | | |
| SE | -0.035357 | 1.000000 | | |
| | 0.6633 | ----- | | |
| SBV | -0.062139 | 0.202174 | 1.000000 | |
| | 0.4439 | 0.0119 | ----- | |
| REV | -0.022544 | 0.051567 | -0.132569 | 1.000000 |
| | 0.7814 | 0.5253 | 0.1012 | |

The results of the regression analysis are provided in Table 3. The research hypotheses are stated thus.

HO₁: Computer software expenses do not have any significant effect on the return on equity of listed deposit money banks in Nigeria.

HO₂: Computer software book value does not have any significant effect on the return on equity of listed deposit money banks in Nigeria.

Table 3: Regression Analysis Result

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|----------|-------------|------------|-------------|--------|
| C | -36.61592 | 0.968341 | -37.81304 | 0.0000 |
| SE | -0.056640 | 0.065502 | -0.864702 | 0.3886 |
| SBV | -0.083110 | 0.046254 | -1.796834 | 0.0344 |
| REV | -0.062557 | 0.158857 | -0.393797 | 0.6943 |

The data in Table 3 resulted in a value of the coefficient of multiple determinations (R^2) of 0.96. Furthermore, the coefficient of the intercept (for the random effect result) is negative. This demonstrates that at any random point in time where these relevant factors are consistent, the deposit cash bank's earnings from equity (performance) do not grow by -36.61592. The standard error test is applied in order to measure the size of the error and determine the degree of confidence in the validity of the estimates. Usually, if the standard error is smaller than half the numerical value of the parameter estimates, it can be concluded that the estimate is statistically significant. Having carried out a standard error test on the parameters estimated and as also indicated by their respective probability values, the parameter estimates for both SE and SBV were viewed as exclusively immaterial and critical, with likelihood values of 0.3886 and 0.0344 separately on ROE (return on equity).

Discussion of Findings

This study used panel series data and regression analysis techniques to investigate the effect of computer software on the performance of listed deposit money banks in Nigeria. The independent variable - AI, was proxied by software expenses (SE) and software book value (SBV) for fourteen (14) listed deposit cash banks in Nigeria during an 11-year period from 2012 to 2022, while the dependent variable was the return on equity, utilized as a proxy to measure performance.

Results from the analysis show that when taken independently and given the probability value of 0.3886, software costs (SE), taken as a measure of AI, have a negative and insignificant effect on ROE, taken as a measure of performance. Similarly, when taken independently and given the probability value of 0.0344, software book value (SBV), also taken as a measure of AI, has a negative but statistically significant effect on ROE. However, when taken collectively, given that the F-statistics is reasonably placed at 844.3074 and the Probability F-statistics indicative of 0.000000, coupled with the Durbin-Watson statistics value of 1.518620, which is within the acceptable threshold of 1.2 to 1.7, it can be concluded that there is a significant effect of Artificial Intelligence on Performance of listed deposit money banks in Nigeria. This study's findings agree with the research endeavors of Uge (2023) and Nwala et al. (2020), who investigated the impact of artificial intelligence on the financial performance of listed insurance agencies in Nigeria.

Conclusion and Recommendations

This study investigated the effect of artificial intelligence investments on the performance of deposit money banks. The panel data analysis was utilized to assess the regression result. At the same time, the F-test and coefficient assurance uncover that the models of the review were significant in making sense of the connection between the dependent and independent variables, which ROE, SE, and SBV caught. Given the findings of the review, the significant connection between the variables of interest, as verified by previous researchers who all experimentally presumed that there is a significant effect between artificial intelligence investments and the performance of listed deposit money banks in Nigeria, shows that the issues in question must remain a focal point.

Consequently, the result showed that when taken independently, software costs (SE), taken as a measure of AI, has a negative and insignificant effect on ROE, taken as a measure of performance, while software book value (SBV), also taken as a measure of AI, has a negative and but statistically significant effect on ROE, taken as a measure of performance. However, when taken collectively and given other statistical indices, it can be concluded that artificial intelligence investment significantly affects the performance of listed deposit money banks in Nigeria. Given the findings of the study, the following recommendations are imperative: 1) Management of deposit money banks in Nigeria can visibly improve their financial position and ultimately enhance their performance by consistently leveraging AI tools and solutions for improved customer satisfaction, and 2) Deposit money banks should implement AI-powered automation to streamline and optimize back-office operations for increased efficiency.

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Appendix: Raw Data Set (provided upon request)