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RESEARCH ARTICLE

EXPLORING THE DYNAMICS OF COMMERCIAL BANKS EXPANSION, MONETARY INDICATORS, AND ECONOMIC GROWTH IN NIGERIA (1981–2021)

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ABSTRACT

This study investigates the dynamic relationship between the expansion of commercial banks, key monetary indicators, and economic growth in Nigeria from 1981 to 2021. Using secondary data from the Central Bank of Nigeria, the study explores how changes in the number of commercial banks (NCB) influence macroeconomic aggregates such as total savings (TS), money supply (MS), credit to the private sector (CPS), and GDP growth (GDPG). Descriptive and normality assessments were conducted, followed by stationarity testing using the Augmented Dickey-Fuller (ADF) method. To account for the mixed order of integration among variables, the Autoregressive Distributed Lag (ARDL) bounds testing approach was applied to determine long-run cointegration relationships. Results reveal significant long-term relationships among the variables, with credit to the private sector and GDP growth exhibiting positive and statistically significant impacts on bank expansion. Conversely, total savings and money supply negatively affect the number of commercial banks, suggesting potential inefficiencies in financial intermediation. The error correction model shows a strong adjustment mechanism toward equilibrium, with approximately 75% of disequilibrium corrected within a year. The findings have important policy implications, underscoring the need for efficient channelling of savings and liquidity, robust credit policies, and macroeconomic stability. This research contributes to the empirical literature by providing a comprehensive, time-series-based understanding of Nigeria's financial sector dynamics and offers evidence-based insights for enhancing the efficacy of banking sector reforms and monetary policy frameworks in developing economies.

KEYWORDS

Commercial Bank Expansion, Money Supply, Economic Growth, ARDL Cointegration, Credit to Private Sector. Nigerian Economy

1. INTRODUCTION

The expansion of commercial banks and its impact on money supply and economic growth has long been a critical area of economic research, especially in developing economies like Nigeria. Over the past few decades, the Nigerian financial sector has undergone significant transformation, marked by an increase in the number of commercial banks, which has substantially influenced money supply and growth trends. Understanding these dynamics is essential for policymakers to formulate effective strategies for economic stability and growth. From the early 1980s, Nigeria's banking sector has seen substantial growth due to deregulation and liberalization policies aimed at enhancing financial inclusion and promoting economic development. The structural reforms in the 1990s and 2000s, including the banking consolidation exercise of 2004, were intended to strengthen the sector by increasing the capital base of banks and reducing the number of smaller, less viable institutions (Ademola, 2022). These reforms were expected to lead to more robust financial intermediation, enhancing the availability of credit and impacting money supply. During this period, the Nigerian economy experienced both significant growth and instability. The expansion of commercial banks was accompanied by fluctuations in inflation rates, money supply, and economic growth. They noted that while financial system advancements in Nigeria had some positive effects, money supply was found to negatively influence economic growth (Weli et al., 2022). This highlighted the complex relationship between financial sector expansion and economic performance.

In recent years, the dynamics of commercial banks' expansion and its impact on money supply have continued to evolve. The global financial crisis of 2008, followed by the COVID-19 pandemic, further influenced monetary policies and financial stability. They emphasized the importance of understanding international capital flows and central banks' monetary responses in shaping economic development, which resonates with the challenges faced by Nigeria's financial sector during these global events (Fu, 2022). Recent studies have continued to explore various facets of this relationship. They investigated the impact of commercial bank deposits and money supply on Nigeria's economic growth, finding a long-term positive relationship (Samuel-Hope et al., 2020). Conversely, they found that while financial development contributes to economic growth, domestic credit to the private sector negatively affects GDP, suggesting that the quality and management of credit are crucial. The interplay between monetary policy and financial stability remains a significant concern (Emeka et al., 2023). Studies such as those have examined factors influencing bank distress, highlighting the role of macroeconomic variables and monetary policies in affecting bank stability (Akani and Kingsley, 2018; Ayeni et al., 2022). The findings underscore the need for effective monetary policy and financial management strategies to mitigate risks and foster economic growth. Comparative studies provide additional insights into how similar issues are addressed in other countries. They explored shadow banking in China and its impact on monetary policy, while found that increases in domestic loan volumes positively impact economic growth in Azerbaijan (Zhang et al., 2020; Zeynalova, 2024). These international perspectives can offer valuable lessons for Nigeria's

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banking sector.

The expansion of commercial banks is a critical factor in shaping the financial landscape and economic growth of Nigeria. Over the past four decades, Nigeria has experienced substantial growth in its banking sector, marked by the proliferation of commercial banks and the broadening of financial services. However, the specific impacts of this expansion on money supply dynamics and economic growth remain underexplored. Despite the extensive body of literature on financial sector growth and economic variables, there is a notable gap in the focused analysis of how the expansion of commercial banks influences Nigeria's money supply and economic growth. He underscores the importance of understanding global capital flows and central banks' monetary responses in shaping economic development, particularly in a post-pandemic context (Fu, 2022). This highlights the need for a nuanced analysis of how domestic banking expansions interact with broader economic forces. They revealed that shadow banking can alter the money multiplier, complicating monetary policy regulation in China (Zhang et al., 2020). While this provides insight into the complexities of monetary policy, there is a lack of similar focused studies in the Nigerian context, particularly regarding commercial banks. They found that financial system advancements in Nigeria negatively affect economic growth, while showed that financial sector liberalization positively impacts market capitalization and transaction volume (Weli et al., 2022; Ademola, 2022). These studies highlight contrasting effects of financial developments, yet they do not specifically address the role of commercial banks in these dynamics.

Moreover, emphasized the significant impact of macroeconomic and bank-specific variables on bank distress, advocating for proactive management strategies (Akani and Kingsley, 2018; Ayeni et al., 2022). While these studies provide valuable insights into the stability and resilience of the banking sector, they fall short of examining the broader economic implications of bank expansion. Additionally, explored how capital inflows and monetary policies affect economic growth and stability, but they do not focus on the direct influence of commercial bank expansion on money supply and economic performance (Duhu et al., 2018; Amaral et al., 2022).

In addition, the review of literature explores the intricate relationship between monetary policy, money supply, credit flows, and economic growth across diverse global contexts. Studies such as emphasize the globalization of capital and the role of shadow banking in complicating monetary policy effectiveness (Fu, 2022; Zhang et al., 2020). Others, like focus on Nigeria, finding that while money supply can spur growth, institutional and policy misalignments often hinder outcomes(Weli et al., 2022; Ademola, 2022). Several studies, use VAR models and panel regressions to show that monetary expansion boosts short-term growth but may lead to inflation or instability long-term (Amaral et al., 2022; Socci et al., 2018; Ali et al., 2018). Across developing nations like Indonesia, Bangladesh, Zimbabwe, Brunei, Nepal, and Mozambique, evidence shows that money supply, interest rates, credit availability, and governance critically influence financial stability and economic performance. Tools like Autoregressive Distributed Lag (ARDL), Generalized Method of Moments (GMM), Fully Modified Ordinary Least Squares (FMOLS), and Granger causality are commonly applied, demonstrating mixed outcomes: while money supply generally supports growth, its uncontrolled expansion or poor coordination with interest rates often exacerbates inflation or increases non-performing loans. The studies underscore the need for balanced, well-regulated financial development, context-specific monetary policy, and the expansion of inclusive banking infrastructure particularly in emerging economies.

Given these insights and gaps in the literature, the motivation for this study is to investigate the specific implications of commercial banks' expansion on Nigeria's money supply dynamics and economic growth. This study aims to fill this research gap by providing an analysis of how the growth of commercial banks affects the money supply and, subsequently, economic performance in Nigeria. Understanding these relationships is crucial for policymakers, financial regulators, and stakeholders in formulating strategies that optimize the benefits of banking sector growth while mitigating potential risks to economic stability. Hence, the objectives of the study include to: examine the trends of the Number of Commercial Banks (NCB), Total Savings (TS), Money Supply (MS), Credit to Private Sector, and GDP Growth (GDPG) with the purpose of discerning their trajectories and patterns; confirm the stationarity of NCB, TS, MS, Credit to Private Sector, and GDPG by ensuring the reliability and precision of subsequent series analyses; ascertain whether there exist stable correlations between NCB, TS, MS, Credit to Private Sector, and GDPG; and determine the cointegrating relationship between TS, MS, Credit to Private Sector, and NCB on GDPG over the long term.

1.1 Conceptual Framework

The conceptual foundation of this study rests on the premise that the expansion of commercial banks significantly influences macroeconomic performance through key financial transmission channels. As the number of commercial banks (NCB) increases, it is expected to enhance access to formal financial services, thereby boosting total savings (TS), expanding the money supply (MS), and increasing credit availability to the private sector (CPS). These financial deepening indicators serve as intermediaries through which banking expansion can exert influence on the broader economy. The framework draws from financial intermediation theory and endogenous growth theory, which posit that well-functioning financial systems are critical enablers of productive investment and sustained economic growth.

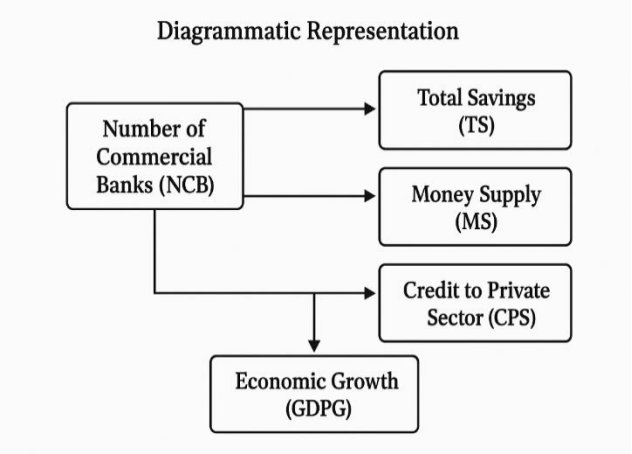

Figure 1: Conceptual Framework Illustrating the Influence of Commercial Bank Expansion on Money Supply and Economic Growth in Nigeria (1981–2021)

Accordingly, the study hypothesizes both direct and indirect linkages between commercial bank expansion and economic growth (GDPG). Direct effects may arise from increased financial sector infrastructure and employment generation, while indirect effects are mediated through savings mobilization, liquidity enhancement, and improved credit allocation. By investigating these pathways within a dynamic econometric framework, this study aims to uncover the extent to which financial sector reforms and institutional expansion have translated into real sector gains in Nigeria from 1981 to 2021. The conceptual model thus provides a structured lens to examine the interplay between financial system development and economic performance, offering valuable insights for evidence-based monetary and financial policy formulation.

2. Research Method

This study relies on secondary data obtained from the Central Bank of Nigeria's Statistical to investigate macroeconomic dynamics spanning four decades (Bulletin, 2021). The dataset includes key indicators; Number of Commercial Banks, Total Savings, Money Supply, Credit to Private Sector, and GDP Growth. The analysis focuses on exploring stationarity, Cointegration, and dynamic relationships to uncover structural linkages influencing economic trends in Nigeria.

2.1 Source of Data

In this research, secondary data has been used. Secondary data was collected from the Central Bank of Nigeria Statistical Bulletin 2021. The variables considered include the Number of Commercial Banks (NCB), Total Saving (TS), Money Supply (MS), Credit to Private Sector (CPS), and Gross Domestic Product Growth (GDPG) from 1981 to 2021. The choice of the 1981 to 2021 period for this study is strategically informed by its encapsulation of four decades of critical economic transformations in Nigeria. This timeframe includes major structural reforms such as the Structural Adjustment Programme (SAP) of the mid-1980s, the banking consolidation and recapitalization policies of the early 2000s, and monetary interventions following global shocks such as the 2008 financial crisis and the COVID-19 pandemic. These events significantly influenced commercial banking operations, monetary aggregates, and macroeconomic growth dynamics. By capturing this extended period, the study enables a comprehensive analysis of long-run trends, cyclical

fluctuations, and the evolving relationships among financial and economic indicators, thereby providing a robust foundation for meaningful econometric modelling and policy interpretation.

2.2 Method of Data Analysis

Many variables in the field of macroeconomics that have a temporal component frequently behave non-stationarity in real-world situations. A time series dataset is said to be stationary when its mean and variance are constant throughout the observed period and are not affected by time. This is a critical statistical quality. A time series is considered stationary if it demonstrates certain traits.

On the other hand, a time series is deemed non-stationary if it's mean and variance vary over time and its covariance between two time periods depends on the particular interval between them rather than on the absolute time. The dataset is essentially non-stationary because its attributes are changing over time.

Several statistical methods are used to thoroughly evaluate a time series dataset's stationarity. Additionally, the Augmented Dickey-Fuller (ADF) test is a commonly used instrument for this purpose. There are numerous tests available for determining stationarity, including the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test, the Phillips-Perron test, and modified variants of the Phillips-Perron test. The ADF test will be utilized in this study's context to assess the stationarity of the data gathered for analysis. This test examines the null hypothesis, which states that the time series data has a unit root, a sign of non-stationarity. The study's objective is to determine whether the important variables remain stable over the designated period by running the dataset through the ADF test. To guarantee the quality and dependability of later time series analyses and to lay a strong basis for the thorough investigation of the connection between economic inflation and international travel in Nigeria, it is imperative to examine stationarity.

2.2.1 The Augmented Dickey-Fuller (ADF) test

When examining economic variables across time in the context of time series analysis, the Augmented Dickey-Fuller (ADF) test is an essential tool for determining if a unit root is present. According to the study, the existence of a unit root denotes non-stationarity, implying that the time series data's mean and variance are not constant during the observed period (Johansen and Juselius, 1992).

The augmented Dickey-Fuller statistic, denoted as:

$$\Delta y_t = \rho \Delta y_{(t-1)} + \partial + \varepsilon_t \quad (1)$$

Where, Δy_t represents the first difference of the time series variable,

ρ symbolizes the coefficient on the lagged first difference,

∂ is the intercept term, and

ε_t is the white noise error term.

In the ADF test, the null hypothesis (H_0) asserts that there is a unit root, which would suggest non-stationarity. At a given confidence level, the stronger the rejection of the null hypothesis, the more negative the augmented Dickey-Fuller statistic is. This follows the rule that a higher negative statistic indicates a more compelling argument against the existence of a unit root.

The standard approach uses the enhanced Dickey-Fuller test with an intercept term. The null hypothesis (H0: No unit root) is to be rejected if the test statistic is less than the critical values of a chosen significance level. If the null hypothesis is not rejected, the procedure is repeated after taking the initial difference and ending with the creation of a stationary time series.

The order of integration, or the number of unit roots, can be inferred from the amount of differencing required to reject the null hypothesis. This procedure guarantees a strong assessment of stationarity, enabling later analyses to be built upon a stable base of dependable and stationary time series data.

2.2.2 Cointegration Test

Cointegration, which examines stationary linear combinations of integrated variables, is one of the core ideas in time series analysis. This scientific method is highly significant since it implies the existence of a shared stochastic trend and a long-run equilibrium for the variables being studied. Long-term forecasts are more accurate when the dynamics of short- and long-term relationships between variables are ascertained through a Cointegration study.

The Engle-Granger technique and the Johansen-Juselius methodology are the two well-recognized methods for conducting Cointegration analysis. These methods take on significance when the variables of interest have the same order of integration.

They introduced the Engle-Granger approach, which is particularly helpful when the variables exhibit different orders of integration (Engle and Granger, 1987). To establish a cointegrating relationship, the variables must first be transformed into stationary series using differencing, and then regression must be used. However, the current study used the Autoregressive Distributed Lag (ARDL) approach to investigate the long-term relationships among variables. This choice is supported by the fact that the variables were integrated into two orders, I(1) and I(0). He popularized the ARDL method, which can handle variables with varying orders of integration, making it a dependable tool for Cointegration analysis (Narayan, 2005).

The ARDL model can be expressed mathematically as follows:

$$\Delta y_t = \alpha + \beta_1 \Delta y_{t-1} + \beta_2 \Delta x_{t-1} + \cdots + \beta_k \Delta x_{t-k} + \varepsilon_t \quad (2)$$

Where, Δy_t *and* Δx_t represent the first differences of the variables under consideration,

α is the intercept term,

$\beta_1, \beta_2, \cdots, \beta_k$ are the coefficients, and

ε_t is the white noise error term.

Utilizing the ARDL methodology, the research guarantees an exhaustive investigation of the enduring associations among variables, providing a sturdy basis for well-informed evaluations and projections.

2.2.3 The Autoregressive Distributed Lag (ARDL) Cointegration Approach

When estimating the Autoregressive Distributed Lag (ARDL) model, it is crucial to make sure the errors match the features of white noise. This is achieved by determining the ideal lag length (p) using a selection criterion, such as the Schwarz Bayesian Criterion (SBC), Akaike Information Criterion (AIC), or Final Prediction Error (FPE). By choosing a lag time that reduces bias or information loss, these requirements help the model operate more precisely.

A time-series sequence with independently distributed random variables and a constant mean and variance is known as white noise. It is essential to the reliability of the ARDL model that the mistakes show characteristics of white noise.

After determining the proper lag length (p), the ARDL model is developed and calculated. The ARDL $(m, n; p)$ model with p exogenous variables can be represented in the following generalised form:

$$\Delta y_t = \alpha + \beta_1 \Delta y_{t-1} + \beta_2 \Delta x_{t-1} + \cdots + \beta_m \Delta y_{t-m} + \gamma_1 \Delta x_{1,t-1} + \gamma_2 \Delta x_{2,t-1} + \cdots + \gamma_n \Delta x_{n,t-n} + \varepsilon_t \quad (3)$$

Where, Δy_t *and* Δx_t denote the first differences of the dependent and exogenous variables, respectively. The model includes lagged terms for both the dependent and exogenous variables (m *and* n lag lengths, respectively).

The coefficients, $\alpha, \beta_1, \beta_2, \cdots, \beta_m, \gamma_1, \gamma_{2,\cdots,} \gamma_{n,}$ capture the impact of past values on the current changes, and ε_t represents the white noise error term.

Through the application of the generalized ARDL model and strict lag length selection criteria, the study guarantees a reliable and accurate depiction of the long-term interactions between variables within the framework of Commercial Banks Expansion on Money Supply and Growth Trends in Nigeria.

The methodological framework adopted in this study, comprising the ADF test for stationarity, Cointegration analysis, and the ARDL modelling approach ensures a rigorous investigation of long-run and short-run economic relationships. These techniques accommodate the mixed order of integration among variables and provide robust insights into how banking sector expansion interacts with monetary and economic growth variables. This approach lays an empirical foundation for policy recommendations aimed at enhancing Nigeria's financial stability and promoting sustainable economic development.

3. Results and Discussions

This section provides an exploration of descriptive statistics and normality assessments for key financial and macroeconomic variables in Nigeria from 1981 to 2021. By evaluating central tendencies, dispersion, and distributional characteristics of the data, we ensure methodological

rigour and proper model specification. These preliminary insights form the foundation for robust econometric modelling, facilitating meaningful interpretation of the relationships among commercial banking dynamics, monetary aggregates, and economic growth trends.

3.1 Descriptive Insights and Data Normality Evaluation of Banking and Economic Indicators (1981–2021)

This section presents the descriptive analysis and normality assessment of key macroeconomic and financial indicators in Nigeria spanning 1981 to 2021. Understanding the central tendency, dispersion, and distributional properties of these variables is critical for selecting appropriate econometric models and ensuring robust statistical inference in subsequent analysis.

Table 1: Descriptive Statistics of Number of Commercial Banks (NCB), Total Saving (TS), Money Supply (MS), Credit to Private Sector (CPS), and Gross Domestic Product Growth (GDPG) from 1981-2021.

Variable	Mean	StDev	Minimum	Median	Maximum	Skewness	Kurtosis
NCB	42.41	22.40	20.00	29.00	90.00	0.91	-0.44
TS	4480.00	6862.00	7.00	488.00	25648.00	1.61	1.76
MS	8126.00	11876.00	14.00	1269.00	40318.00	1.42	0.80
CPS	6571.00	9589.00	9.00	765.00	32868.00	1.35	0.60
GDPG	3.04	5.40	-13.13	3.65	15.30	-0.85	2.00

The result presented in Table 1 found that NCB has a mean of 42.41 with considerable variation (StDev = 22.4), indicating a broad range of commercial banks' counts across the years under study. TS, MS, and CPS show high standard deviations relative to their means, suggesting significant variability in savings, money supply, and credit to the private sector. GDPG has a relatively smaller mean (3.04) and standard deviation (5.4), indicating more stable economic growth rates with occasional large deviations as seen from the minimum value of -13.128. It was found that NCB, TS, MS, and CPS are positively skewed, indicating that most of the observations are below the mean with some extreme high values. Also, GDPG was found to be negatively skewed, suggesting that most observations are above the mean with some extreme low values. Further result showed that NCB has negative kurtosis, suggesting a flatter distribution compared to the normal distribution. TS and MS have higher positive kurtosis, indicating a more peaked distribution with fatter tails, implying more frequent extreme values. GDPG also shows positive kurtosis but is closer to the normal distribution. However, these statistics provide an overall picture of the variability, central tendency, and distribution shape of the variables, which can be valuable for further economic analysis.

Table 2: Normality Test of Number of Commercial Banks (NCB), Total Saving (TS), Money Supply (MS), Credit to Private Sector (CPS), and Gross Domestic Product Growth (GDPG)

Variable	Anderson-Darling (A-D) Statistic (*p*-value)	Log transformation Anderson-Darling (A-D) Statistic (*p*-value)
NCB	3.06 ($p < 0.005$)	0.49 ($p > 0.15$)
TS	4.95 ($p < 0.005$)	0.77 ($p > 0.10$)
MS	4.76 ($p < 0.005$)	0.51 ($p > 0.15$)
CPS	4.87 ($p < 0.005$)	0.12 ($p > 0.25$)
GDPG	0.80 ($p > 0.10$)	0.23 ($p > 0.25$)

The results of the Anderson-Darling (A-D) normality test in Table 2 indicate that the original (non-transformed) data for four key economic variables, Number of Commercial Banks (NCB), Total Saving (TS), Money Supply (MS), and Credit to Private Sector (CPS) deviate significantly from normality, with A-D statistics of 3.06, 4.95, 4.76, and 4.87 respectively, all associated with p-values less than 0.005, indicating strong evidence against the null hypothesis of normality. In contrast, after applying the log transformation, these same variables exhibit much lower A-D values: 0.49 for NCB, 0.77 for TS, 0.51 for MS, and 0.12 for CPS, with p-values greater than 0.10, suggesting that the log transformation effectively normalised the data. The GDP Growth (GDPG) variable showed an A-D statistic of 0.80 ($p > 0.10$) in its raw form and 0.23 ($p > 0.25$) post-log transformation, indicating that it already approximates a normal distribution and benefits marginally from transformation. These findings justify the use of log-transformed values in subsequent econometric modelling, such as ARDL or VAR analysis, to satisfy the assumption of normality and improve estimation efficiency.

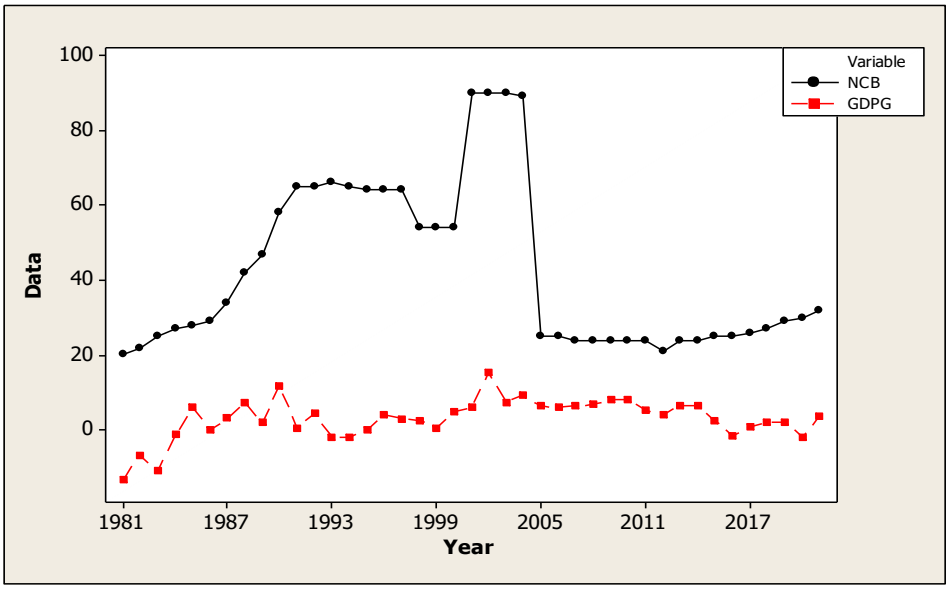

Figure 2: Graph of the Number of Commercial Banks and GDP Growth in Nigeria from 1981 - 2021

The result presented in Figure 2 shows that the number of commercial banks increased steadily from 20 in 1981, peaking at 90 in 2001, before dropping significantly to 25 in 2005 when recapitalization of banks occurred and remaining relatively stable around 24-32 in subsequent

years. GDP growth rates are highly variable, with significant fluctuations over the years. The lowest point was -13.13% in 1981, with various periods of positive and negative growth, reaching 3.65% in 2021. The volatility in GDP growth reflects the economic challenges and shocks the country has faced, including political instability, oil price fluctuations, and global economic conditions. Despite periods of negative growth, there are also periods of significant positive growth, indicating resilience and recovery phases.

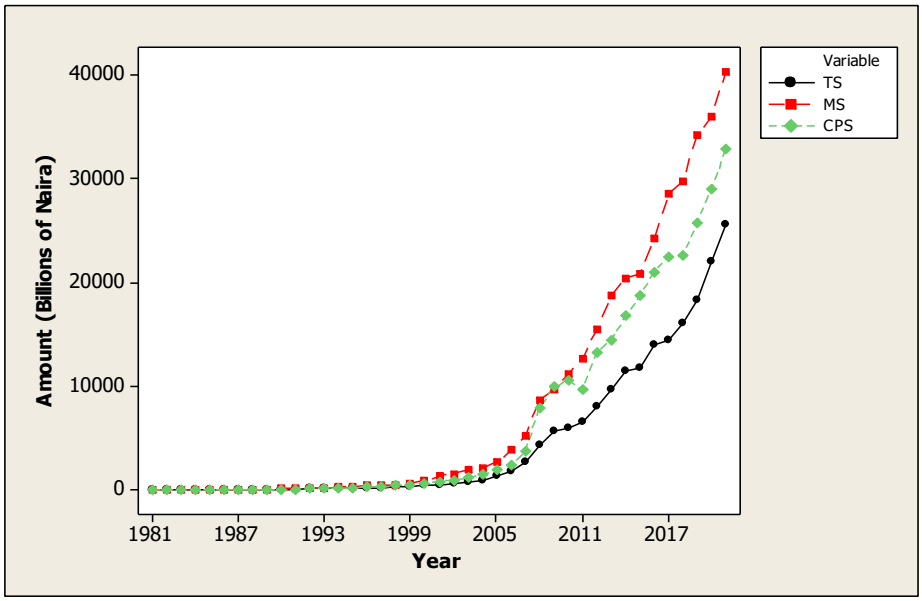

Figure 3: Graph of the trend of TS, MS and CPS from 1981-2021

The result presented in Figure 3 showed that Total Savings has a consistent upward trend, starting from 6.56 in 1981 and reaching a peak of 25648.26 in 2021. This sharp increase indicates growing financial inclusion and higher levels of public savings over time, possibly driven by economic growth, improved banking infrastructure, and increased trust in the financial system. Money supply follows a similar upward trend as Total Savings, starting from 14.47 in 1981 and increasing dramatically to 40318.29 in 2021.The rising money supply reflects the expansionary monetary policies, increased economic activities, and efforts by the central bank to support economic growth through liquidity injections. Credit to the private sector has shown substantial growth, starting at 8.57 in 1981 and rising to 32868.49 in 2021. This growth highlights the increasing role of the private sector in the economy and the banking sector's increased lending capacity. It also suggests improved access to finance for businesses and individuals, facilitating economic development.

Figures 2 and 3 were plotted separately due to the distinct nature and scale of the variables they represent. Figure 1 illustrates the Number of Commercial Banks (NCB) and GDP Growth (GDPG) both of which are count and percentage-based measures, typically fluctuating within limited numeric ranges. In contrast, Figure 2 displays monetary variables, Total Savings (TS), Money Supply (MS), and Credit to Private Sector (CPS) with values in billions of Naira, growing exponentially from the early 2000s to over ₦40,000 billion by 2021. Plotting them together would distort interpretability, as the vast magnitude of monetary values would overshadow the relatively smaller figures of NCB and GDPG, rendering trends in the latter almost invisible on the same axis. Separate plots thus ensure clarity, scale integrity, and more accurate visual interpretation for both sets of economic indicators.

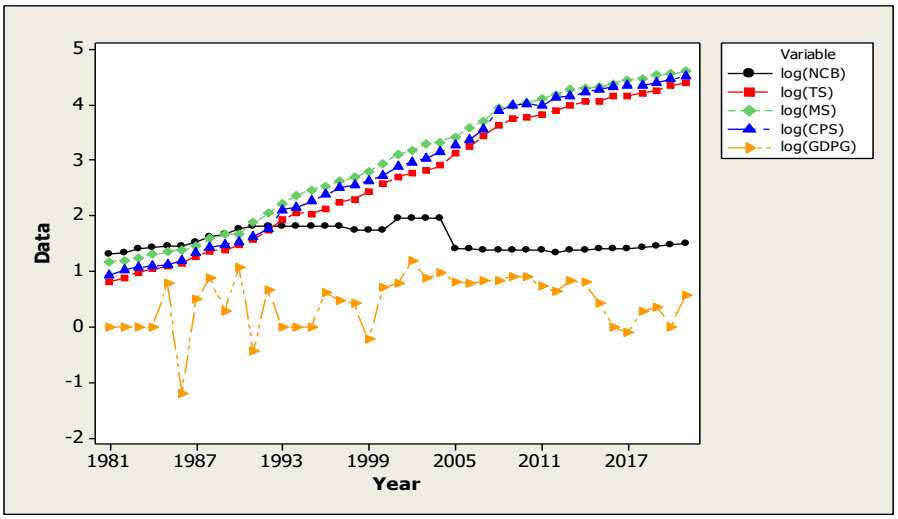

Figure 4: Graph of the trend of log(NCB), Log(TS), log(MS), log (CPS) and Log(GFDPG)

The trends in Figure 4 reveal significant patterns in the variables over time. Log(NCB) showed a steady increase from 1.3010 in 1981 to 1.5052 in 2021, indicating consistent growth in the banking sector, though it plateaued in the early 2000s before resuming growth. Log(TS) exhibited a continuous upward trend, increasing sharply from 0.8171 in 1981 to 4.4091 in 2021, reflecting an expanding savings base. Similarly, Log(MS) grew steadily from 1.1605 in 1981 to 4.6055 in 2021, suggesting substantial monetary expansion over the decades. Log(CPS) also showed consistent growth, rising from 0.9329 in 1981 to 4.5168 in 2021, indicating increasing financial support to the private sector. However, Log(GDPG) displayed more volatility, with periods of negative growth, such as -1.2154 in 1986, and intermittent recovery, peaking at 1.1855 in 2002 before stabilizing around moderate values like 0.5619 in 2021. This variability reflects fluctuations in economic performance due to policy changes, global economic conditions, and structural adjustments. Hence, the trend illustrates long-term growth in banking, savings, money supply, and private sector credit, juxtaposed with the more erratic trajectory of GDP growth.

3.2 Testing the variables for Stationarity

A stationary process is a process or series whose properties do not depend on the time at which the series was observed. For this purpose, the Augmented Dickey-Fuller (ADF) test was used to test the stationarity of

the data.

Table 3: Result of Augmented Dickey-Fuller unit root test for the variables

Variables	Level		1st Difference		Order of integration
	No Trend	With Trend	No Trend	With Trend	
Log(NCB)	-1.8621	-2.0939	-5.7855	-5.7844	I(1)
Log(TS)	-2.1190	-4.2902	-	-	I(0)
Log(MS)	7.6376	2.4312	1.2956	-6.1581	I(1)
Log(CPS)	5.7227	1.6505	0.7155	-5.0703	I(1)
Log(GDPG)	-3.1421	-2.7334	-10.3574	-10.5636	I(1)
Critical values					
5%	-2.9369	-3.5266	-2.9389	-3.5297	

The Augmented Dickey-Fuller (ADF) unit root test results in Table 3 indicate the stationarity levels of the variables under consideration. At levels, none of the variables are stationary, as the test statistics do not exceed the critical values at a 5% significance level. However, after the first differencing, Log(NCB), Log(MS), Log(CPS, and Log(GDPG) become stationary, as their test statistics (-5.7855, -6.1581, -5.0703, and -10.3574 respectively, without trend) exceed the critical value of -2.9389. This indicates that these variables are integrated into order one, I(1). On the other hand, Log(TS) was stationary at zero differencing, with a test statistic of -4.2902 (with trend) exceeding the critical value of -3.5266, indicating it is integrated of order zero, I(0). Thus, the variables exhibit mixed orders of integration, with most being I(1) and one being I(0).

3.3 Co-integration test of the Macroeconomic Variables

Given the mixed integration orders observed in the ADF test results in Table 3, where most variables are integrated into order one, I(1), and one variable is integrated into order zero, I(0), the Autoregressive Distributed Lag (ARDL) approach is well-suited for evaluating long-term relationships among these variables. The ARDL methodology is robust to variables with different integration orders, provided none are integrated of order two or higher.

The ARDL model is known to allow for the inclusion of variables that are of mixed integration within the same framework, making it an ideal choice for this analysis. The model's flexibility in handling small sample sizes and its ability to estimate both short- and long-term dynamics further enhance its suitability. By employing the ARDL bounds testing approach for cointegration, it is possible to ascertain whether a long-term equilibrium relationship exists among the variables, even with their differing integration properties.

Thus, the ARDL approach provides a robust framework for exploring the long-term relationships between variables such as Log(NCB), Log(MS), Log(CPS, Log(GDPG), and Log(TS) while addressing the challenges posed by their mixed orders of integration.

Table 4: Result of test for the existence of level relationship amongst the variables in the ARDL

Number of regressors	**Value of statistic =4**
Computed F-statistic	20.5631
5% critical value	
Lower bound value	3.47
Upper bound value	4.57

The critical bound values were extracted from (Pesaran et al., 2001).

The results of the ARDL bounds test in Table 4 provide strong evidence of a level relationship among the variables in the model. The computed F-statistic of 20.5631 significantly exceeds the upper bound critical value of 4.57 at the 5% significance level, as outlined by (Pesaran et al., 2001). This result allows the rejection of the null hypothesis of no cointegration and concludes that a long-term equilibrium relationship exists among the variables when there are four regressors (K=4). The implication is that changes in the independent variables are associated with persistent and systematic changes in the dependent variable over time. This finding supports the appropriateness of using the ARDL model to estimate both the short-term dynamics and long-term relationships among the variables, ensuring a robust understanding of their interdependencies.

Table 5: Estimated long-run coefficients: ARDL(1, 4, 4, 4, 4) selected by Hannan-Quinn criterion (HQ)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(TS)	-6.1423	0.7514	-8.1741	0.000
LOG(MS)	-3.8121	0.9282	-4.1070	0.0011
LOG(CPS)	6.5079	1.1798	5.5162	0.0001
LOG(GDPG)	0.5557	0.1014	5.4802	0.0001

The results in Table 5 present the estimated long-run coefficients from the ARDL(1, 4, 4, 4, 4) model, selected using the Hannan-Quinn (HQ) criterion. These coefficients indicate the long-term relationships between the dependent variable and the independent variables. The coefficient of LOG_TS is -6.1423 (t-statistic = -8.1741, p<0.001), suggesting a statistically significant and negative long-run relationship between LOG(TS) and the dependent variable. This implies that a 1% increase in LOG(TS) is associated with a 6.14% decrease in the dependent variable, holding other factors constant. Similarly, LOG(MS) has a significant negative coefficient of -3.8121 (t-statistic = -4.1070, p=0.0011), indicating that a 1% rise in LOG(MS) corresponds to a 3.81% decrease in the dependent variable.

In contrast, LOG(CPS) and LOG(GDPG) exhibit positive and statistically significant long-run effects on the dependent variable. The coefficient of LOG(CPS) is 6.5079 (t-statistic = 5.5162, p<0.001), meaning a 1% increase in LOG(CPS) leads to a 6.51% rise in the dependent variable. Similarly, the coefficient of LOG(GDPG) is 0.5557 (t-statistic = 5.4802, p<0.001), indicating that a 1% increase in LOG(GDPG) results in a 0.56% increase in the dependent variable. These findings demonstrate that LOG(CPS) and LOG(GDPG) positively drive the dependent variable in the long run, while LOG(TS) and LOG(MS) exert significant negative influences. The high t-statistics and low p-values across all variables confirm the robustness and significance of these relationships at conventional significance levels.

From the result presented in Table 5, the Co-integration equation can be expressed as equation (4):

Cointeq = LOG(NCB) - (-6.1423*LOG(TS) -3.8121*LOG(MS) + 6.5079

*LOG(CPS) + 0.5557*LOG(GDPG) (4)

Table 6: Error correction representation of the selected ARDL model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(TS))	-3.625193	0.397466	-9.120762	0.0000
D(LOG(TS)(-1))	-1.366594	0.374203	-3.652015	0.0026
D(LOG(TS)(-2))	1.610807	0.369901	4.354700	0.0007
D(LOG(TS)(-3))	1.641380	0.366445	4.479193	0.0005
D(LOG(MS))	-0.657980	0.388491	-1.693682	0.1124
D(LOG(MS)(-1))	0.600009	0.325872	1.841242	0.0869
D(LOG(MS)(-2))	-0.881945	0.343527	-2.567325	0.0224
D(LOG(MS)(-3))	2.720952	0.351222	7.747096	0.0000
D(LOG(CPS))	1.827704	0.299221	6.108199	0.0000
D(LOG(CPS)(-1))	0.210566	0.248921	0.845912	0.4118
D(LOG(CPS)(-2))	-0.568410	0.250923	-2.265277	0.0399
D(LOG(CPS)(-3))	-2.595301	0.340041	-7.632315	0.0000
D(LOG(GDPG))	0.113923	0.019679	5.789191	0.0000
D(LOG(GDPG)(-1))	-0.020269	0.019039	-1.064581	0.3051
D(LOG(GDPG)(-2))	-0.157270	0.030981	-5.076287	0.0002
D(LOG(GDPG)(-3))	-0.118413	0.034490	-3.433265	0.0040
CointEq(-1)	-0.752290	0.115516	-6.512456	0.0000

The error correction representation of the ARDL(1, 4, 4, 4, 4) model in Table 6 provides insights into the short-run dynamics and the speed of adjustment toward long-run equilibrium. The coefficient of the error correction term (CointEq(-1)) is -0.7523 and statistically significant (p-value = 0.000), indicating that approximately 75.23% of any disequilibrium in the system is corrected within one period, highlighting a strong adjustment mechanism toward the long-run equilibrium.

In the short run, changes in log(TS) (total savings) exhibit significant effects. The immediate impact is negative (-3.6252, p = 0.000), while lagged changes, such as at the second and third lags, are positive and significant (1.6414, p = 0.0005), suggesting oscillatory adjustments. For log(MS) (money supply), the contemporaneous impact is insignificant (-0.6580, p = 0.1124), but the third lag has a strong positive effect (2.7210, p = 0.0000), indicating delayed effects of monetary changes.

Changes in log(CPS) (credit to the private sector) show a significant positive immediate effect (1.8277, p = 0.0000), but higher lags, such as the third lag (-2.5953, p = 0.0000), exhibit negative impacts, reflecting a complex interaction between credit and other variables. For log(GDPG), the immediate effect is positive and significant (0.1139, p = 0.0000), while higher lags, such as the second (-0.1573, p = 0.0002) and third (-0.1184, p = 0.0040), are negative, suggesting that initial growth stimuli may reverse over time.

Hence, the model underscores the dynamic interplay among the variables, where short-run adjustments are significant and align with long-term equilibrium, as evidenced by the strong and significant error correction term.

Figure 5: Graph comparing the Actual, Fitted and residual measures of the model

The results of the actual, fitted, and residual values in Figure 5 provide a detailed assessment of the model's predictive accuracy over the observed period. The residuals, calculated as the difference between actual and fitted values, indicate the degree of error in the model's predictions. For instance, in 1985, the actual value was 1.4472, while the fitted value was 1.4524, resulting in a small residual of -0.0053, suggesting a close fit. Similarly, for 2010, the actual value was 1.3802, and the fitted value was 1.32712, yielding a residual of 0.0531, indicating a slightly larger deviation. The residuals fluctuate around zero, showing no clear systematic pattern, which suggests the model is unbiased in its predictions. However, some years exhibit relatively larger residuals, such as 1995 (-0.0566) and 2003 (0.0529), indicating periods where the model's predictions were less accurate. On the other hand, years like 1996 (0.0005) and 2011 (0.0015) show extremely small residuals, demonstrating excellent predictive performance during those periods.

Hence, the residuals' variability indicates that the model captures the general trend effectively, with occasional periods of over- or underestimation. The lack of systematic bias in the residuals supports the validity of the model.

4. Discussion of Results

The findings of this study offer critical insights into the complex dynamics of commercial bank expansion, money supply, and economic growth in Nigeria over the past four decades. The descriptive statistics reveal significant variability in financial indicators, especially in Total Savings (TS), Money Supply (MS), and Credit to the Private Sector (CPS), reflecting Nigeria's evolving monetary landscape. The normality assessments justify the use of a logarithmic transformation for accurate modelling, aligning, who emphasised the need for data normalisation in financial modelling (Weli et al., 2022; Samuel-Hope et al., 2020). The ARDL bounds test confirms a long-run equilibrium relationship among the variables, supporting studies, which indicate that financial reforms and banking expansion significantly influence macroeconomic stability (Fu, 2022; Emeka et al., 2023).

In the long run, the model reveals a negative relationship between total savings and money supply with the number of commercial banks, which may suggest inefficiencies in the intermediation process or saturation effects within the banking sector. Conversely, credit to the private sector and GDP growth show significant positive impacts, aligning with the views, who noted that effective financial intermediation can enhance economic development (Zhang et al., 2020; Zeynalova, 2024). The strong and significant error correction term in the short-run model implies a robust mechanism of adjustment toward long-run equilibrium, reinforcing the dynamic interplay between financial reforms and macroeconomic indicators. This is in line, who underscored the role of monetary policy in stabilizing the financial system (Akani and Kingsley, 2018).

These findings have important policy implications. First, they suggest that the quality and channelling of savings and money supply must be re-evaluated to ensure their productive deployment. Second, increasing credit to the private sector appears to be a vital driver of both banking expansion and broader economic growth. Lastly, the significance of GDP growth highlights the need for macroeconomic stability to support sustainable financial development. This study contributes to the empirical literature by confirming the long-term link between financial sector dynamics and economic performance in a developing economy context, with a methodology that accommodates the mixed integration order of variables.

5. Conclusion

This study explored the interlinkages between commercial bank expansion, monetary indicators, and economic growth in Nigeria over forty years. The findings affirm that the dynamics of Nigeria's financial sector are significantly shaped by the expansion of commercial banks and their interaction with savings mobilization, money supply, and private sector credit. Specifically, while increased credit to the private sector and GDP growth positively influenced the number of commercial banks, total savings and money supply were negatively associated with bank expansion. These contrasting effects suggest inefficiencies in intermediation and potential challenges in the utilization of financial resources for productive investments.

The presence of a significant long-run equilibrium relationship validated through ARDL bounds testing and a strong error correction mechanism underscores the responsiveness of the financial system to both shocks and policy interventions. These results emphasize the importance of maintaining macroeconomic stability and enhancing the quality of credit to the private sector.

Policy recommendations arising from the study include: (i) reforming savings mobilization frameworks to ensure their effective transformation into credit; (ii) monitoring money supply growth to avoid inflationary pressures while fostering productive investment; and (iii) strengthening the regulatory capacity of financial institutions to promote inclusive financial intermediation. By addressing structural inefficiencies and enhancing the synergy between financial and real sectors, Nigeria can leverage bank expansion as a strategic tool for sustainable economic development. This study, therefore, offers a valuable empirical basis for policy deliberation and contributes to the broader discourse on financial sector-led growth in developing economies.

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