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ASSETS AND LIABILITIES MANAGEMENT AND GROWTH OF DEPOSIT MONEY BANKS IN NIGERIA

BY

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Abstract

Considering the need for banks to remain liquid and profitable without jeopardizing the interests of stakeholders, the study was carried out to assess the implications of assets and liabilities management on the growth of banks in Nigeria. The study covered a period of 40 years. Ex-post facto research design was adopted in the study. Selected assets and liabilities variables were used in the study. For bank assets variables, they all exhibited a positive and statistically significant relationship with the explained variable (growth rate of banks' total assets) when managed separately. Also, all liabilities variables exhibited positive and statistically significant relationship with the explained variable. Dissimilarly, when both assets and liabilities variables are managed together, banks' reserve – an asset variable, and banks' savings deposits – a liability variable, showed non-significant relationship with the explained variable. On the whole, none of the variables exhibited a negative relationship with the explained variable either separately or jointly. This clearly implies that both assets and liabilities are needed to drive growth in banks. Banks are encouraged to increase efforts on creation of assets and mobilization of liabilities.

Keywords: Banks assets management, banks liabilities management, and growth of banks
JEL:

1. INTRODUCTION

Every business has some forms of assets and liabilities to manage. Assets are what the business owns while liabilities are what the business owes to outsiders. Assets can also be seen as resources used in generating other resources. Increase in either assets or liabilities affects the business negatively or positively. A balance of both assets and liabilities is beneficial to businesses generally, though it poses some forms of dilemma in banking business. Businesses survive by taking risks. In finance and investment, the tenet is, "the higher the risk, the higher the return, and *vice versa*".

For banks to make profit they need to increase their assets by way of increased credit facilities (loans and advances) and for them to be liquid they have to reduce lending and hold more cash so as to meet their short-term maturing obligations on demand. Bank management is saddled with the responsibility of ensuring adequate balance between banks' assets and liabilities. Some level of trade-offs is required to meet management's objective in some situations.

The growth of banks is vital for the smooth operation of the financial system of a country (Tektas *et al*., 2005). In our country, even though the financial sector is regulated as all of other countries financial sector, it is contributing a lion share for the healthiness of the country's financial system (Francis, 2007). The sector's growth and profitability is of major concern to those who are responsible for policy-making and operating day-to-day with it. Among the possible factors that have effect on commercial banks' growth, asset liability management (ALM) is the major one {Kosmidou (2004); Shubiri (2010); Sayeed and Hoque (2008); Asiri (2007)}.

Assets and liabilities management involves the strategic management of the assets and liabilities of an institution (bank) to optimize profitability, improve liquidity, and to protect it against various bank risks (Brick, 2014). It is an indispensable part of risk management, which is at the very core of financial management of banks. According to Gup and Brooks (1993), ALM goes beyond managing individual assets and liabilities but adopts an integrated approach of managing the two sides of the balance sheet of a bank simultaneously

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{Zawalinska, (1999) and Charumathi (2008)}. Charumathi (2008) sees ALM from management functions of planning, organizing, coordinating, and controlling the assets and liabilities; their mixes, volume, maturities, yield, and costs in order to achieve a specified level of profitability.

Since banks pay interest on deposits received or mobilized and also receive interest payment from borrowers for loans and advances granted, their payoffs and profitability can be accessed through the spread of the interest rates. Spread in this sense, is the difference between interest received and interest paid. Obviously, interest received by banks from customers is usually higher than interest paid by banks to their customers. Spreads become profits or payoffs when the loan granted are paid back as and when due without any legal or issues requiring special loan recovery efforts that could eat in to the profit attained through the spread.

This study becomes necessary because banks' assets and liabilities management is an ongoing responsibility that must be undertaken on a daily basis. Profitability and liquidity must be attained by banks and hence, continuous assessment of this responsibility to track compliance and ensure a sound banking system which ultimately guarantees a sound financial system.

The general objective of this study is to examine the impact of assets and liabilities management (ALM) on the growth of Deposit Money Banks in Nigeria. However, the specific objectives include:

i. To assess the extent to which reserves, loans/advances, and unclassified assets (bank assets variables) affect the growth of Nigerian deposit money banks.

ii. To evaluate the impact of demand, time, and savings deposits (bank liability variables) on the growth of Nigerian deposit money banks.

iii. To determine the extent to which bank asset variables and bank liabilities variables jointly impact the growth rate of Nigerian deposit money banks.

Findings from this research work will be of immense benefits to different stakeholders in the financial sector of the economy. Chief among them is the banking industry. It will help Deposit Money Banks (DMBs) on optimum asset and liability portfolio mix to overcome the problems of mismanagement in the banking sector. In addition, it shall serve as a source of empirical literature to students of banking, finance, economics, and management, among others.

The study is organized in to five sections including introduction, review of related literature, methodology, discussion of results and summary, conclusion, and recommendations.

2. Review of Related Literature

Literature is awash with papers and articles on banks' assets and liabilities management in their various forms and compositions. Most of the papers examine the impact or effect of assets and liabilities management on bank profitability and also liquidity. The decision to carry out this study is justified by the fact that much has not been done in the area of the impact of assets and liabilities management on the growth of banks, even though it could be seen at some point that a profitable bank is a growing bank. The major difference in this study was the choice of the dependent variable. This section of the study will be approached in three sub-sections encompassing conceptual literature, theoretical literature, and empirical literature.

2.1 Conceptual Review

The conceptual review deals with various concepts evolving around the study. However, it will be deliberated under various sub-headings and sections.

2.1.1 Definitions and Concept of Asset-Liability Management

Asset liability management, ALM, is defined in different ways by various scholars and sites. Baum (1996) define asset-liability management as the practice of managing a business so that decisions and actions taken with respects to assets and liabilities are coordinated in order to ensure effective utilization of company's resources to increase its profitability. Investopedia.com defines asset-liability management is the process of managing the use of assets and cash flows to reduce the firm's risk of loss from not paying a liability on time. Well-managed assets and liabilities increase business profits. According to Tee (2017), asset-liability management refers to the ongoing process of formulating, implementing, monitoring, and revising strategies related to assets and profitability to achieve an organization's financial objectives given the organization's risk tolerance and other constraints. He added that the core objective of asset-liability management is to maximize profit through efficient fund allocation given an acceptable risk structure.

The concept of the Assets and Liabilities Management is said to have been developed as a hedging reaction against the risk of financial intermediation. It is also seen as a discipline which has been in operation since the beginning of 1970s. Shrestha (2015) stressed that at the initial stage, the management was based on the simple gap model that analyzes risk in terms of cash flows and the gaps or mismatches between assets and liabilities. As the experiences of financial institutions with risk management evolved, the cash flow gap models gradually gave way to duration gap models, which look more at the market value of the bank's rate-sensitive assets and rate-sensitive liabilities (to changes in interest rates) rather than just at the difference between them.

Asset-Liability management is relevant to and critical for, the sound management of the finances of any organization that invests to meet its future cash flow needs and capital requirements. Traditionally, asset-liability management has focused primarily on the risks associated with changes in interest rates. Currently, however, credit management considers a much broader range of risks including equity risk, liquidity risk, legal risk, currency risk, and sovereign or country risk (Tee, 2017). Charumathi (2008) defines ALM as a dynamic process of planning, organizing, coordinating, and

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

controlling the assets and liabilities; their mixes, volume, maturities, yield, and costs in order to achieve a specified net interest income (NII). In other words, it deals with the optimal investment of assets in view of meeting current goals and future liabilities. It is therefore appropriate for institutions (banks, finance companies, leasing companies, insurance companies, and others) to focus on asset-liability management when they face financial risks of different types. He added that asset liability management includes not only a formalization of this understanding but also a way to quantify and manage these risks.

It is the practice of managing risks that arise due to mismatches between, the assets and liabilities of the bank. Asset-liability management is an approach that provides institutions with mechanisms that makes such risk acceptable. The short-term objective of ALM in a commercial bank is to ensure liquidity while protecting the earnings and the long-term goal is to maximize the economic value of the bank i.e. "the present value of commercial bank's expected net cash flows, defined as the expected cash flows on assets minus the expected cash flows on liabilities plus the expected net cash flows on off-balance sheet (OBS) positions" (Basel Committee on Banking Supervision, 2006). Other objectives of ALM are maximizing profitability, ensuring structural liquidity, and ensuring robustness in market risk management.

According to Ogbeifun and Akinola (2018) ALM is based on three basic pillars which are Asset-liability Management (ALM) Process**,** Asset-liability Management (ALM) Organization, and Asset-liability Management (ALM) Information System**.**

i) **Asset-liability Management (ALM) Process:** "Given the central role of market and credit risk in its core business, a financial institution's success requires that it be able to identify, assess, monitor and manage these risks in a sound and sophisticated way" (Rowe *et al.* 2004). ALM is a systematic approach that attempts to provide a degree of protection to the risk arising out of the asset/liability mismatch (Ogbeifun and Akinola, 2018).

ii) **Asset-Liability Management (ALM) Organization:** Satchidananda and Prahlad (2006) asserted that the Board of Directors would have the overall responsibility for ALM in any organization and should lay down the organization's philosophy in relation to this. However, the Asset-liability Committee (ALCO) is responsible for deciding on the business strategies consistent with the laid down policies and for implementing them. Typically, ALCO consists of the senior management, including the Chief Executive Officer (Ogbeifun and Akinola, 2018).

iii) **Asset-liability Management (ALM) Information System:** Information is of great importance to the ALM process. There should be a proper management information system which provides accurate, adequate, and reliable information to the relevant people, mainly ALCO so that the necessary information becomes available on a timely basis (Ogbeifun and Akinola, 2018).

2.1.2. Effects of ALM on Banks Profitability

Several researchers such as Alper and Anbar (2011) and Ramlall (2011), have conducted studies in this area and found that bank profitability can be hindered by both internal and external factors. The internal factors are related to bank management which encompasses the asset-liability management culture of the bank and external determinants are factors which reflect the economic and legal environment that affect the operation and performance of banks. The common macroeconomic factors that determine the profitability of banks in general are the GDP, inflation rate, market interest rates, and ownership. The above studies employed the statistical cost accounting (SCA) model to examine the effect of asset-liability management on banks profitability. Ramlall (2009) and Alper and Anbar (2011) found that bank profitability can be hindered by both internal and external factors. Internal factors are related to bank management which encompasses the ALM culture of the bank and external determinants are factors which reflect the economic and legal environment that affect the operation and performance of commercial banks.

The common macroeconomic factors that determine the profitability of banks in general and commercial banks in particular are GDP, inflation rate, market interest rates, and ownership. With regard to the microeconomic determinants of commercial banks' profitability, ALM plays a dynamic role. In a different study, Dash and Pathak (2011) proposed a linear model for asset-liability assessment. They found that public sector banks have the best asset-liability management positions. In their turn, they reported that public sector banks had a strong short-term liquidity position, but with lower profitability, while private sector banks had a comfortable short-term liquidity position, balancing profitability. Therefore, in assessing the effect of asset-liability management on commercial bank's profitability, it can be concluded that on the average, assets impacted positively while liabilities impacted negatively on the profitability of banks. The profitability of banks is vital for the smooth operation of the financial system of a country (Tektas *et al*., 2005).

In the area of banking, different authors try to study the determinants of commercial banks' profitability. According to Hester and Zoellner (1966), there is statistically significant relationship between ALM and profitability and they disregard the null hypothesis that there is no relationship between them. On the contrary, Kosmidou*et al.* (2004) found that liability management plays its own pivotal role in contributing to profitability difference among commercial banks. However, before this study, Vasiliou (1996) suggests that asset management rather than liability management play the key role in explaining the differences in banks' profitability. Practically, there are also other macroeconomic

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factors that have effect on commercial banks profitability and growth. Although they have not found evidence that differential returns and costs on different categories of assets and liabilities exist.

Asiri (2007) found that assets management and liabilities management exhibit positive and negative relationships, respectively, with the profitability of Kuwaiti banks. Similarly, Belete (2013) found that the profitability of commercial banks is positively affected by assets management, except for fixed assets, and is negatively affected by liability management while real growth in GDP and the general rate of inflation have negative effect on banks profitability.

2.1.3. The Impact of Asset-Liability Management (ALM) on Banks

Banks have always played major roles in the economic development and their operations are always affected by macroeconomic conditions (CBN, 2004). A sound, progressive, and dynamic banking system is a fundamental requirement for economic growth and development. As an important segment of the tertiary sector of an economy, deposit money banks act as the backbone of economic growth and prosperity by acting as a catalyst in the process of development. They inculcate the habit of saving and mobilize funds from numerous small households and business firms spread over a wide geographical area. The funds mobilized are used for productive purposes in agriculture, oil and gas, industry, and trade (Abayomi and Shalem, 2001). The stability of deposit money banks as whole in the economy depends on proper Asset-Liability Management (ALM) structures. Better asset-liability management has the tendency to manage risks and shocks that DMBs can face (Tee, 2017).

Moreover, asset-liability management is the prerequisite for the efficiency and growth of deposit money banks. Asset-liability management in Deposit Money Banks is determined by the ability of the banks to retain capital, absorb loan losses, support future growth of assets, and provide return to investors. The largest source of income to the bank is interest income from lending activity less interest paid on deposits and debt. But it should be noted that banks cannot give out loans without deposit and banks primarily makes their profit through loan creation (Ogbeifun and Akinola, 2018). For a bank to attain the same objectives then it has to ensure proper Asset Liability Management, including liquidity risk management, interest rate risk management, and credit risk management (Ebong, 2005).

2.2 Theoretical Review

Broad ideas and theories guiding this research will be considered and discussed below. These theories are the Redington's Theory of Immunization, Modern Portfolio Theory (MPT), Liability Management Theory, Commercial Loan Theory, Theory of Asset Allocation and Risk, and Efficient Frontiers and Asset Allocation Theory. Their consideration is aimed to show the link between Asset-liability management and bank performance.

2.2.1 The Liability Management Theory

Since the early 1960s, the loan portfolios of commercial banks have been affected by the emergence of a new theory, which became known as the liability management theory. This is one of the important liquidity management theories and says that there is no need to follow old liquidity norms like maintaining liquid assets, liquid investments, etc. Lately, banks have focused on liabilities side of the balance sheet. According to this theory, banks can satisfy liquidity needs by borrowing in the money and capital markets. The fundamental contribution of this theory is to consider both side of the balance sheet as sources of liquidity (Emmanuel, 1997). Today, banks use both assets and liabilities to meet liquidity needs. Available sources of liquidity are identified and compared to expected needs by the bank's asset and liability management committee (ALCO). Key considerations include maintaining high asset quality and a strong capital base that both reduce liquidity needs and improve the bank's access to funds at low cost.

2.2.2. Redington's Theory of Immunization:

This theory is an asset liability management model and is a practical model to date. Redington, (1952), and Haynes and Kirton, (1952) are well-known proponents of the liability management theory. They analysed the financial structure of a life office and in particular, the relationship between the assets and liabilities of a life insurance fund. Their specific problem was how to determine the allocation of assets to make them as far as possible, equally as vulnerable as the liabilities to those influences (typically the effects of fluctuations in the market rate interest) which affect both. The notion of equating the mean term of assets with the mean term of liabilities has been used for many years by a number of insurance companies worldwide.

The theory further states that a bank can hold reserves by building additional liabilities against itself via different sources. These sources comprise issuing time certificates of deposit, borrowing from other commercial banks, borrowing from Central Bank, raising Capital funds through issuing shares, and by ploughing back of profits. This theory recognizes the fact that asset structures of a bank have a prominent role to play in providing it with liquidity that it needs. The approach is considered more aggressive than the other methods as it enhances fund raising opportunities for execution of attractive investments.

2.2.3 Markowitz Mean-Variance Efficiency - Modern Portfolio Theory (MPT)

Markowitz (1952, 1959) and Roy (1952) laid the foundations of modern portfolio theory (MPT). This theory propounded that risk and return go hand in hand. The basic assumption underlying MPT is that investors avoid taking risk (risk-averse) i.e. they choose a low-risk portfolio of assets over a high-risk portfolio for a given return. Thus, an investor will assume more risk only if she is expecting a higher return for the excessive risk. Assuming risk is inherent part of the higher return, the construction of return-optimized portfolios by risk-averse investors for a given risk level is explained by MPT theory. For a given level of risk, it is possible to find an "efficient frontier" of optimal portfolios yielding the maximum possible expected return for a given risk level and

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

vice-versa. "The efficient frontier is a parabola in the mean/variance space and a hyperbola in the mean/standard deviation space" (Merton, 1972).

2.2.4 The Commercial Loan Theory or Real Bills Doctrine:

This theory originated in England during the 18th century. It is also referred to as the Real Bills Doctrine and is of English origin. Historically, liquidity management focused on assets and was closely tied to credit policies. Prior to 1930, the commercial loan theory encouraged banks to make only short-term, self-liquidating loan facilities. Such loans closely matched the maturity of bank deposits and enabled banks to meet deposit withdrawals with funds from maturing loans. Logical basis of the theory, commercial bank deposits are near-demand liabilities and should have short-term self-liquidating obligations (Emmanuel, 1997). Bankers long ago recognized the advantage of making self-liquidating loans (otherwise known as real bills, or claims on real resources) in order to resolve the liquidity-earnings problems.

2.2.5 Theory of Asset Allocation and Risk:

Investing funds in different asset classes lies at the core of risk diversification philosophy. Not putting all eggs in one basket is the proverbial saying which embodies the wisdom of risk diversification. By allocating assets to a mix of investments classes, investors diversify their investments and minimize the downside risk. Asset allocation makes intuitive sense because when the price of one asset class goes down, other assets may perform better thereby reducing the likelihood of loss (Dilawar, 2018).

2.3 Empirical Review

Empirical review is aimed at highlighting research works in the area of asset and liabilities management earlier conducted by other researchers.

Singhal *et al.* (2023) investigated Assets-Liability management in a comparative study of private-sector and public-sector banks in India. The study involved calculating various financial ratios of the banks and analyzing them critically. It was found that both private sector and public sector banks were performing satisfactorily in terms of credit–deposit ratio, quick ratio, interest spread, and other income-to-total income ratio. Retail banks, corporate, commercial, and investment banks were included in the study.

Kallur (2016) an international banker and risk management executive investigated the assets-liability management from the risk manager's perspective. The author noted that ALM focuses more on risks analysis and medium-and long term financing needs. Besides, ALM is concerned with the strategic management of the assets (uses of funds) and liabilities (sources of funds) of banks against risks caused by changes in the liquidity position of the bank, interest rates, exchange rates, and against credit risk and contingency risk. An attempt to provide a practical view of the daily ALM techniques used in managing the volume, mix, maturity, rate sensitivity, quality, and liquidity of assets and liabilities as a whole in order to achieve an acceptable risk/reward ratio.

Owusu and Alhassan (2020) investigated ALM and bank profitability using Statistical Accounting Analysis technique. The study focused on emerging markets in Ghana. The relationship between profit and ALM Structure of 27 banks over a period of nine (9) years (2007-2015) was examined. Findings confirmed the central hypothesis of the SCA model providing evidence that profitability is linked to Balance Sheet items in Ghana. It was revealed that domestic banks have higher return on assets than foreign banks during the period covered by the study.

Peykani *et al.* (2023) examined optimization of ALM of banks with minimum possible changes. They saw ALM of banks as simultaneous planning of all bank's assets and liabilities under different conditions with the aim of maximizing profits and minimizing the risks in banks by optimizing the factors in the Balance Sheet. They proposed a linear model using constraints to achieve optimal values of the parameters of balance sheet with ALM objectives, balance sheet, system, and regulatory constraints. Results obtained showed that the values cash and receivables from banks and other credit institutions decreased by 30 percent and increased by 200 percent, respectively. Besides, total income, operating income, and non-operating income grew by 30 percent each.

Salim and Haque (2016) studied the impacts of ALM policy on the profitability of sampled banks in Bangladesh. They employed Statistical Cost Accounting (SCA) model to assess the degree of relationship of different assets and liability variables with banks profitability using time series data spanning 2003 and 2014. Loans and advances was found to have a significant positive relationship with banks' profitability.

Haslem *et al.* (1999) used canonical analysis and the interpretive framework of asset and liability management in order to identify and interpret the foreign and domestic balance sheet strategies of large United States banks in the context of the "crisis in lending to Less Developed Countries." The study revealed that the least profitable very large banks have the largest proportion of foreign loans, but they focus on asset/liability matching strategies.

Odhiambo (2006) surveyed the liability management practices in commercial banks in Kenya and found out that regular and systematic appraisal of asset liability management policies was a common practice among most banks. Most banks also indicated that their Asset liability management systems were governed by guidelines set by the management board which is a cross functional outfit covering all the major functions in the bank this showed that Asset liability management is a highly strategic issue in most banks, regardless of their size, extensively utilized most of the conventional hedging instruments. Hence the need to establish the significance of the ALM practices in managing liquidity risk.

Muhammed (2007) studied liquidity management approaches and their effect on profitability of commercial banks in Kenya. Findings reveal that the most popular theory with bankers is commercial loan theory followed by asset liability management theory. The evidence of use of shiftability and

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

anticipated income theory is weak. However, there was one bank that employed a hybrid strategy (i.e. anticipated and commercial loan theory).

Angele (2008) in her research on analysis of chosen strategies of asset and liability management in commercial banks found that the core problem in asset and liability management is the fact that the main asset of commercial bank credits cannot always be liquid, especially if the country's economy is in deep recession.

Mihail (2009) studied how asset liability management affect profitability of Banks. The main goal of his paper was to analyze the asset-liability management in banks for the period spanning 2004 and 2011. They adopted a panel of over 30 banks across Europe. The analysis was carried out using the canonical correlations where she tested for a linear dependency between two variables, i.e. (the structure of assets and liabilities.) The study concluded that in order to be effective in banks, the management of assets and liabilities must take into consideration the risk level, earnings, liquidity, profit, solvency and the levels of loans and deposits.

Muhammad and Mohammad (2009) assessed the impact of ALM on profitability of banks recognized that Private commercial Banks are better than public banks in terms of asset management, but they do not have any superiority over public banks in terms of liability management. This does not provide them conclusive support that ALM in private banks is superior to ALM in public banks. Thus, study could not explain the profitability differences between these two sets of banks through analyzing ALM. Their study considered the market concentration index and GDP growth rate as key variables.

Ajibola, John, and Lezaasi (2013) in examining the management of the financial statement of the bank (2007 to 2011), using Goal programming technique found out that the goals formulated can be maximally attain besides the goal of liability reduction. They, therefore, suggested that bank should convert their liabilities to earning assets as soon as possible.

Tamiru (2013) carried out a research on asset liability management and commercial Banks profitability in Ethiopia, the study examined the effect of ALM on commercial banks profitability in Ethiopian financial market. The Service Component Architecture (SCA) model was used to estimate the profitability which is measured by ROA as a function of balance sheet and macroeconomic explanatory variables. The model hypothesized that the rate of return on earning assets is positive and varies across assets, and the rate of cost on liabilities is negative and varies across liabilities.

Dilawar (2018) investigated the effects of asset liability management (ALM) from a theoretical and modeling perspective. Adopting the Markowitz Portfolio and Advanced Mathematical Techniques/Computation as the acceptable theory and model respectively, it was concluded that the approaches help in multi-period investment decisions, portfolio rebalancing and accommodating uncertainty by examining few economic states in the future.

Ogbeifun and Akinola (2018) carried out a research on a comparative study of asset-liability management framework in the banking industry in Nigeria. Applying Ordinary Least Square Linear Regression technique on Shareholders' funds, Total Assets (independent variables), and profit after tax (dependent variable) of deposit money banks in Nigeria. The result shows that Shareholders' Funds positively relate to profitability and significant at 5 percent and that the Total Asset also positively relate to profitability at 5 percent level of significance. The study concluded that an efficient Asset-Liability Management has significant influence on profitability.

Pooja *et al.* (2018) investigated the effect of asset liability management and profitability in the modern era Asset Liability Management and profitability in the modern era. The study revealed that asset liability management is a comprehensive and dynamic methodology for quantifying, monitoring, and managing a bank's market risk. Additionally, a unit change in ALM position as a result of increased loans and decreased deposits results in a drop in the banks' average profitability. As a result, the study recommends that bank management implement methods to attract deposits and low-cost funding in order to address any possible financial imbalances that could drive banks to rely on pricey debt capital.

Abebe (2022) conducted a research on the effect of asset and liability management on the financial performance of microfinance institutions: evidence from sub-Saharan African region. Applying robust fixed effects regression model on balanced panel data of 106 MFIs from 25 SSA countries from 2014 to 2018, the study revealed that All other asset variables (including cash and cash equivalents, fixed assets, and other assets) have no significant impact on the overall ROA of MFIs in SSA whereas liabilities variables (cost of interest rate on other liabilities (L3) and bonds (L2)) were higher and have significant negative impact on MFIs' return. It was concluded that MFIs should devote their time and attention to managing their liabilities in order to improve their financial performance.

Lysiak *et al* (2022) investigated Banking Risks in the Asset and Liability Management System. The work aims to build a model for assessing banking risks. However, using the primary study method in economic–mathematical modeling based on the standardized model of the Basel Committee for Operational Risk Management, the modified CAPM model, and the model developed by Shapiro and Cornell for currency risk management. The information base was the financial statements of Bank Credit Agricole (Poland). As a result, an economic–mathematical model is built, which is the optimal combination of operational, currency, and credit risk management models. This model calculates the optimal values of bank balance sheet items, which allows for making the right management decisions. It allowed adjusting the value of the bank profit by 3.6 million US dollars. In conclusion,

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

considering the results of banking risk modeling, the need to build a strategy for the bank's development is determined.

3. METHODOLOGY

This chapter captures research design, nature and sources of data, techniques of data analysis, model specification, and decision rule, among others.

3.1 Research Design

By the nature of this work, this study adopted ex post facto research design which involves the observation of events that have indeed taken place already and it is quite appropriate for this study. However, time series data were collected from Central Bank of Nigeria statistical bulletin of various years. The research was designed to examine the impact the assets and liabilities management (ALM) on the growth of deposit money banks in Nigeria. The Bank Reserves (BRs), Bank Loans/Advances (BLAs), Bank Unclassified Assets (BUAs) and Bank Demand Deposits (BDDs), Bank Time Deposits (BTDs), Bank Savings Deposits (BSDs) were used as proxies for explanatory variable for bank assets and liabilities respectively bank total assets (BTA) represented the dependable variable.

Secondary data obtained from the Central Bank of Nigerian (CBN) Statistical Bulletin were used in the study. The data were presented and described with the aid of tables and graphs. Multiple regression approaches were used in testing the various hypotheses earlier stated and in examining the effect of independent variables on the dependent variable.

Models (functional and empirical) specified for the purpose of testing the hypotheses of the study are presented in the equations below:

Y= a + bx

..... Equation (1)

Hypothesis Number One:

H_{o1}:There is no significant effects of reserves, loans and advances, and unclassified assets (bank asset variables) on total assets (TA).

BTA = *f*(BR, BLA, BUA) ……..…… Equation (2)

$BTA = \beta_0 + \beta_1 BR + \beta_2 BLA + \beta_3 BUA + \mu$ …… Equation (3)

Hypothesis Number Two

H_{o2} There is no significant effects of demand deposits, time deposits, and savings deposits (bank liability variables) on total assets (TA).

BTA = *f*(BDD, BTD, BSD) ……... Equation (4)

$BTA = ¥_0 + ¥_1 BDD + ¥_2 BTD + ¥_3 BSD + \varepsilon$ …… Equation (5)

Hypothesis Number Three

H_{o3}: There no significant relationship between reserves, loans and advances, unclassified assets (bank asset variables), and demand deposits, time deposits, savings deposits (bank liability variables) on total assets (TA).

BTA = *f*(BR, BLA, BUA, BDD, BTD, BSD) ……. Equation (6)

$BTA = ʎ_0 + ʎ_1 BR + ʎ_2 BLA + ʎ_3 BUA + ʎ_4 BDD + ʎ_5 BTD + ʎ_6$ BSD + ð …….. Equation (7)

Where:

BTA = Bank Total Assets
BR = Bank Reserves
BLA = Bank Loans/Advances
BUA = Bank Unclassified Assets (fixed and noncurrent assets)
BDD = Bank Demand Deposits
BTD = Bank Time Deposits
BSD = Bank Savings Deposits
$\beta_0, ¥_0, ʎ_0$ = constants for the three equations,
β_1---β_3; $¥_1$---$¥_3$; $ʎ_1$--- $ʎ_3$ = coefficients of the independent variables of the three equations, and
β_0 = Intercept of the Regression Line
β_1 ----- β_6 = Regression coefficient
μ, ε, ð = error terms for hypotheses one, two, and three.

3.6 Method of Data Analysis

The study employed secondary data. Accordingly, pretests were conducted. These included test of stability of the model (cusum and cusum of squares) and unit root test. Other tests conducted were Variance Inflation Factor test and Breusch-Godfrey Serial Correlation LM Test. The researcher adopted the Ordinary Least Square (OLS) method of data analysis. The data were also subjected to correlation analysis and Johansen co-integration test. These tests help to determine the suitability of the data for the purposes intended.

3.7 Decision Rule

The decision to either accept or reject a hypothesis was based on p-values of the variables and the F-Statistic value (F-cal.) of the model. A significant relationship is determined when the p-value of the variable is less than or equal to 0.05 percent and *vice versa.*

4. Discussion of Results

In this section, various tests and regression results were considered and discussed in order to provide clarity and adequate understanding of the paper.

4.1. Descriptive Analysis:

The characteristics of the data used in the study are described in this sub-section of the study. The focus is on measures of central tendency, measures of dispersion, and data normality measures. Table 4.1 shows the variables and their values.

Table 4.1: Descriptive Statistics

	GBTA	GBLA	GBUA	GBR	GBDD	GBTD	GBSD
Mean	0.22096	0.22444	0.20178	0.31164	0.21549	0.22431	0.22287

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Median	0.18347	0.19216	0.16972	0.16371	0.13886	0.16794	0.20528
Maximum	0.58865	0.98826	0.94268	1.85417	0.70665	0.8082	0.49116
Minimum	-0.01092	-0.13894	-0.18283	-0.427	-0.07235	-0.31322	0.01673
Std. Dev.	0.15761	0.23095	0.24625	0.47991	0.20715	0.25738	0.12502
Skewness	0.72969	1.40537	0.99774	1.21539	0.63169	0.41662	0.45138
Kurtosis	2.54918	5.41439	3.85315	4.42181	2.34643	2.77647	2.33922
Jarque-Bera	3.8884	22.8825	7.84964	13.2171	3.37215	1.24044	2.08601
Probability	0.1431	1.1E-05	0.01975	0.00135	0.18525	0.53783	0.35239
Sum	8.8385	8.97771	8.07102	12.4656	8.6197	8.97223	8.91485
Sum Sq. Dev.	0.96878	2.08021	2.36491	8.98222	1.67347	2.58359	0.60959
Observations	40	40	40	40	40	40	40

Source: Researcher's Eviews Computation, 2023

It is obvious in Table 4.1 that Banks reserves has the highest mean growth rate value followed by loans and advances, bank time deposits, savings deposits, banks total deposits (0.311, 0.2244, 0.2243, 0.222, 0.220), respectively, while bank unclassified assets has the least growth rate value. Also, bank reserves has the maximum growth rate value followed by banks loans and advances, unclassified assets, while banks savings deposits has the least value. All variables exhibited negative minimum growth rate except bank savings deposit. Jarque-Bera probability values revealed the all the variables have normal distribution except bank unclassified assets and reserves. The study covered the period of 40 years spanning 1982 and 2021.

4.2 Correlation Analysis:

Correlation analysis was undertaken to assess the extent to which the variables of the correlate with one another.

Table 4.2: Correlation Matrix

	GBTA	**GBLA**	**GBUA**	**GBR**	**GBDD**	**GBTD**	**GBSD**
GBTA	1						
GBLA	0.6351421	1					
GBUA	0.6641685	0.4681409	1				
GBR	0.4061387	0.1036849	0.2169565	1			
GBDD	0.8244959	0.4660727	0.4733653	0.39904	1		
GBTD	0.7169865	0.4949029	0.3993273	0.152209	0.5831889	1	
GBSD	0.6644191	0.3343658	0.4232401	0.405409	0.7222055	0.2676415	1

Source: Researcher's Eviews Computation, 2023

Table 4.2 shows that there is no evidence of high correlation among the variables. To corroborate this position, the results of Variance Inflation Factor (VIF) in Table 4.3 shows the centered VIF values of less than 10.0 which is the acceptable threshold for absence of collinearity among the variables. The highest value in the table is 3.34 and the least is 1.24, all within the acceptable threshold for VIF.

Table 4.3: Variance Inflation Factors

Variance Inflation Factors

Date: 12/28/23 Time: 14:08

Sample: 1981 2021

Included observations: 40

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
C	0.000453	5.108023	NA

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GBLA	0.002649	3.057260	1.552979
GBR	0.000493	1.788875	1.248779
GBUA	0.002237	2.518465	1.491430
GBDD	0.007084	7.050042	3.341319
GBTD	0.002554	3.308926	1.860032
GBSD	0.014017	10.25816	2.408375

Source: Researcher's Eviews Computation, 2023

4.3 Stationarity test (Unit Root test):

Unit Root test was conducted to determine the order of integration of the variables so as to guide the decision on which statistical method(s) of regression would be used in the study. From Table 4.4, it is evident that all the variables were cointegrated at level {that is, I(0)}. With the results, it is appropriate to analyze the data using Ordinary Least Squares (OLS) technique of multiple regression.

Table 4.4: Results of Unit Root Test

Variables	ADF value	Critical value @		Order of Integration	P-values
		1%	5%		
GBTA	- 3.631364	-4.226815	-3.536601	I(0)	0.0406
GBLA	- 4.243016	- 4.211868	-3.529758	I(0)	0.0092
GBR	- 4.164404	- 4.244868	-3.529758	I(0)	0.0113
GBUA	- 5.117739	- 4.244868	-3.529758	I(0)	0.0009
GBDD	- 3.926568	- 4.244868	-3.529758	I(0)	0.0202
GBTD	- 4.875123	- 4.244868	-3.529758	I(0)	0.0017
GBSD	- 4.602268	- 4.244868	-3.529758	I(0)	0.0036

Source: Researcher's Eviews Computation, 2023

4.4 Stability Test:

To assess the level of stability of the variables used in specifying the models of the study, cumulative sum (CUSUM) test and cumulative sum (CUSUM) of squares test were conducted and both clearly revealed that the variables used in the models are stable. Figures 4.1 and 4.2 show the results of the tests.

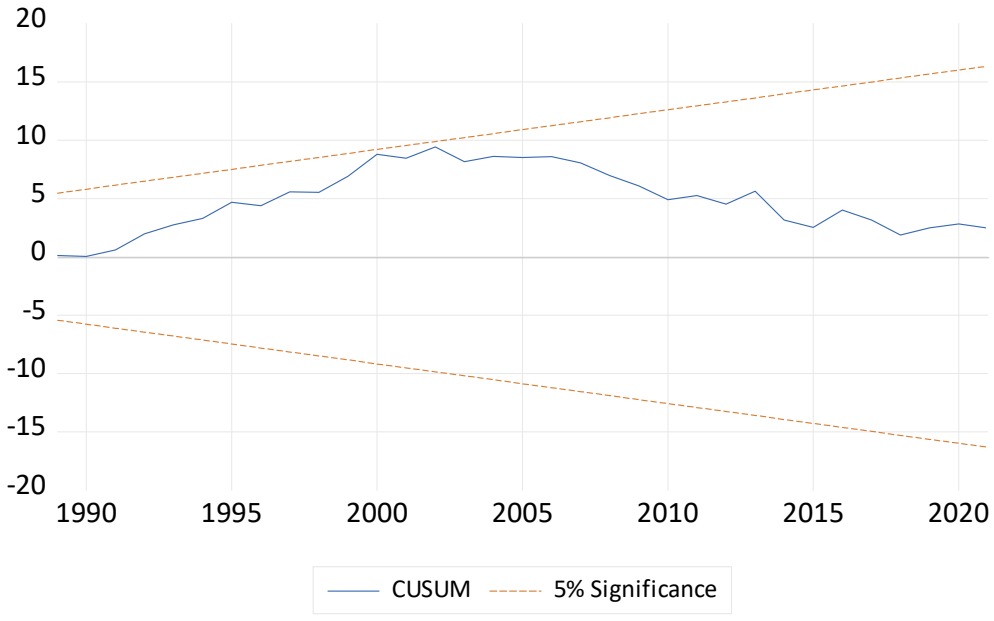

Figure 4.1: Cumulative Sum Test Results
Source: Researcher's Eviews Computation, 2023

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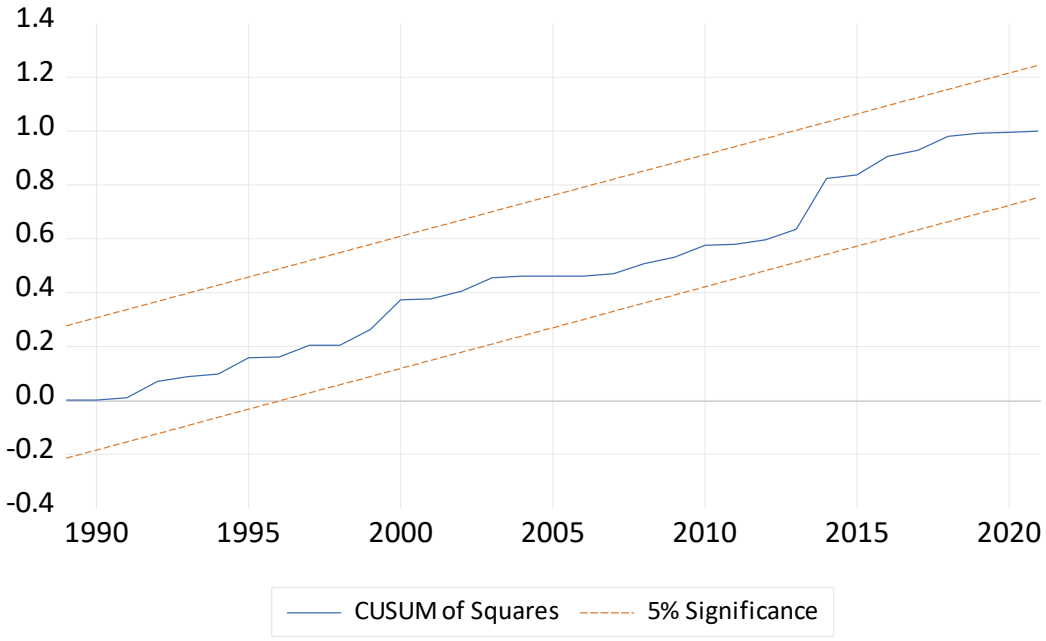

Figure 4.2: Cumulative Sum of Squares Test Results
Source: Researcher's Eviews Computation, 2023

4.5 Cointegration Test:

The essence of cointegration tests is to assess whether there is a long run relationship among the variables used in the study. In this study, the presence of three cointegrating equations in both Trace test and Max-eigen test, respectively, confirm the existence of long run equilibrium among the variables of the study. Results in Tables 4.5 and 4.6 showcase this position.

Table 4.5: Results of Trace Test

Date: 12/28/23 Time: 14:26
Sample (adjusted): 1984 2021
Included observations: 38 after adjustments
Trend assumption: Linear deterministic trend (restricted)
Series: GBTA GBLA GBR GBUA GBDD GBTD GBSD
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.769017	211.7136	150.5585	0.0000
At most 1 *	0.767035	156.0281	117.7082	0.0000
At most 2 *	0.644472	100.6671	88.80380	0.0053
At most 3	0.518825	61.36936	63.87610	0.0798
At most 4	0.356994	33.57145	42.91525	0.3085
At most 5	0.229778	16.79063	25.87211	0.4307
At most 6	0.165383	6.869747	12.51798	0.3583

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Eviews Computation, 2023

Table 4.6: Results of Maximum EigenvalueTest

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized	Max-Eigen	0.05

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.769017	55.68556	50.59985	0.0137
At most 1 *	0.767035	55.36093	44.49720	0.0023
At most 2 *	0.644472	39.29777	38.33101	0.0386
At most 3	0.518825	27.79790	32.11832	0.1540
At most 4	0.356994	16.78082	25.82321	0.4763
At most 5	0.229778	9.920883	19.38704	0.6273
At most 6	0.165383	6.869747	12.51798	0.3583

Max-eigenvalue test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Researcher's Eviews Computation, 2023

4.6 Regression Analyses:

Regression Analysis was conducted to determine the relationship between the independent variables and the dependent variables. It allows for the understanding of how changes in the independent variables affect the dependent variable. The results obtained for each of the models of the study are presented in Tables 4.7, 4.8, and 4.10, respectively.

Table 4.7: Regression result for Banks Assets Variables (Objective Number One)

Dependent Variable: GBTA

Method: Least Squares

Date: 12/28/23 Time: 14:01

Sample (adjusted): 1982 2021

Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.076393	0.023768	3.214118	0.0028
GBLA	0.282848	0.076440	3.700264	0.0007
GBR	0.090007	0.033299	2.702969	0.0104
GBUA	0.262849	0.073045	3.598466	0.0010

R-squared	0.647315	Mean dependent var	0.220963
Adjusted R-squared	0.617925	S.D. dependent var	0.157609
S.E. of regression	0.097422	Akaike info criterion	-1.724899
Sum squared resid	0.341674	Schwarz criterion	-1.556011
Log-likelihood	38.49799	Hannan-Quinn criter.	-1.663835
F-statistic	22.02473	Durbin-Watson stat	1.864180
Prob(F-statistic)	0.000000		

Source: Researcher's Eviews Computation, 2023

From the results in Table 4.7, all bank asset variables chosen for the study (bank loans and advances, bank reserves, and bank unclassified assets) exhibited positive and statistically significant relationship with the growth rate of banks' total assets. In addition, the results revealed that 64.73 per cent variation in the growth rate of banks assets (dependent variable) is caused by the interactions of the independent variables. Also, the probability of F-statistic value of 0.000000 indicates that the model fits the data. Furthermore, the Durbin-Watson statistic value of 1.864180 clearly shows that the model is free from serial autocorrelation.

*Corresponding Author: **MICHAEL, Emmanuel Ikpe.**

Table 4.8: Regression Results for Banks Liabilities Variables (Objective Number Two)

Dependent Variable: GBTA
Method: Least Squares
Date: 12/28/23 Time: 14:01
Sample (adjusted): 1982 2021
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.022628	0.025969	0.871345	0.3893
GBDD	0.285831	0.101354	2.820135	0.0078
GBTD	0.259017	0.058557	4.423317	0.0001
GBSD	0.352856	0.141582	2.492248	0.0174

R-squared	0.798985	Mean dependent var	0.220963
Adjusted R-squared	0.782234	S.D. dependent var	0.157609
S.E. of regression	0.073549	Akaike info criterion	-2.287093
Sum squared resid	0.194740	Schwarz criterion	-2.118205
Log likelihood	49.74186	Hannan-Quinn criter.	-2.226029
F-statistic	47.69699	Durbin-Watson stat	2.357567
Prob(F-statistic)	0.000000		

Source: Researcher's Eviews Computation, 2023

From the results in Table 4.8, all the variables – bank demand deposits, banks time deposits, and banks savings deposit (taken as growth rate) have positive and statistically significant relationship with the growth rate of banks total assets. The independent variables selected for the study caused 79.90 percent variations in the dependent variable. Besides, the probability of F-statistic value of 0.000000 indicates that the model fits the data. Furthermore, the Durbin-Watson statistic value of 2.357 clearly suggests that the model has some collinearity problems. In order to probe this further, Breusch-Godfrey serial correlation LM test was conducted and the abridged results presented in Table 4.9 with the probabilities of F-statistic and Chi-Square of 0.3831 and 0.3337, respectively, the issue of serial autocorrelation is of no effect to the model.

Table 4.9: Results of Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.987016	Prob. F(2,34)	0.3831
Obs*R-squared	2.194952	Prob. Chi-Square(2)	0.3337

Source: Researcher's Eviews Computation, 2023

Table 4.10: Results of Both Banks Assets and Liabilities Variables (Objective Number Three)

Dependent Variable: GBTA
Method: Least Squares
Date: 12/28/23 Time: 13:57
Sample (adjusted): 1982 2021
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.014599	0.021285	0.685890	0.4976
GBLA	0.117115	0.051464	2.275652	0.0295
GBR	0.034716	0.022209	1.563137	0.1276
GBUA	0.144488	0.047301	3.054629	0.0044
GBDD	0.214860	0.084164	2.552859	0.0155
GBTD	0.191473	0.050539	3.788627	0.0006
GBSD	0.228184	0.118392	1.927359	0.0626

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R-squared	0.879151	Mean dependent var	0.220963
Adjusted R-squared	0.857178	S.D. dependent var	0.157609
S.E. of regression	0.059563	Akaike info criterion	-2.645929
Sum squared resid	0.117077	Schwarz criterion	-2.350375
Log likelihood	59.91859	Hannan-Quinn criter.	-2.539066
F-statistic	40.01122	Durbin-Watson stat	2.553348
Prob(F-statistic)	0.000000		

Source: Researcher's Eviews Computation, 2023

Tables 4.7 and 4.8 showed the interactions of banks' assets variables and liabilities variables differently (that is, in isolation). Table 4.10 shows the results of joint interaction among the variables of banks assets and banks' liabilities. From the interaction, all the selected variables exhibit positive relationship with the growth rate of banks total assets. Also, all the variables show statistically significant relationship with the growth rate of banks' total assets except bank reserves (asset variable) and savings deposit (liabilities variable). Jointly, both the assets variables and liabilities variables can cause 87.91 percent changes in the growth rate of banks total assets (dependent variable). Besides, the probability of F-statistic value of 0.000000 indicates that the joint model fits the data. Furthermore, the Durbin-Watson statistic value of 2.357 clearly suggests that the model has some collinearity problems. In order to probe this further, Breusch-Godfrey serial correlation LM test was conducted and the abridged results presented in Table 4.11 with the probabilities of F-statistic and Chi-Square of 0.1513 and 0.1008, respectively, serial autocorrelation is of no effect to the joint model.

Table 4.11: Results of Breusch-Godfrey Serial Correlation LM Test for Assets and Liabilities Variables

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.008656	Prob. F(2,31)	0.1513
Obs*R-squared	4.588944	Prob. Chi-Square(2)	0.1008

Source: Researcher's Eviews Computation, 2023

4.7: Discussion of Findings and Policy Implications

In line with the regression results obtained for the study, all the assets variables selected for the study exhibited positive and statistically significant relationship with the growth rate of banks total assets when managed separately. This finding conforms to the findings in Owusu and Alhassan (2020), Abebe (2022), and Tamiru (2013) which concluded that bank asset variables have significant impact on performance of deposit money banks in Nigeria. In like manner, all the liabilities variables used in the study exhibited positive and statistically significant relationship with the growth rate of banks total assets when managed separately. This means that bank demand deposits, bank time deposits, and bank savings deposits are significant and they possessed positive effect on the BTA. It implies that increase in deposit mobilization aids in increasing banks total assets (BTA) which in turn assist in increasing the growth rate of the banks. These results support the facts that banks need both assets and liabilities to function efficiently and effectively. Furthermore, all assets and liabilities variables managed jointly equally exhibited positive relationships with the growth rate of banks total assets. It was equally found that all the variables except bank reserves (an asset variable) and savings deposits (a liabilities variable) still exhibited statistically significant relationships with the growth rate of banks total assets. Findings of Hester and Zoellner (1966) corroborate these findings. In a similar study in Kuwait, Asiri (2007) found that assets and liabilities management exhibit positive and negative relationships, respectively, with the profitability of banks.

5. Conclusions and Recommendations

The study of assets and liabilities management and growth of deposit money banks in Nigeria has revealed that assets and liabilities jointly make a bank. Also, that assets are derived from the liabilities. It also implies that banks' liabilities drive banks' assets. The researcher decided to use the growth rate of all the variables in the study. Results obtained from the study showed that both assets and liabilities variables selected for the study have positive relationships with the dependent variable (growth rate of banks' total assets). Empirically, the results obtained and the findings therefrom are a function of the volumes of each variable (asset or liability) at a particular point in time. Bank reserve, an assets variable, and savings deposit, a liability variable exhibited a non-significant relationship with the dependent variable while all other variables (both assets and liabilities) of the study exhibited significant relationship with the dependent variable. It is pertinent to clarify that bank reserve, an asset variable used in the study comprises Deposit Money Banks' deposits with the Central Bank of Nigeria (CBN).

In order to avoid any reputational issues and other risks that may arise as a result of lopsided assets or liabilities position, bank management owes the banking public and other stakeholders in the industry a balanced asset and liability management position that will ensure profitability and liquidity while warding off any risks manifestations.

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