JOURNAL of BANKING

THE CHARTERED INSTITUTE OF BANKERS OF NIGERIA
Vol. 12 No. 1. June 2024 ISSN 2736-1772 N1000

- Does The Financial Sector Credit Drive Small And Medium Scale Enterprises Growth?
- Inflationary Trends And Interest Rate Nexus: A Causality Approach
- Long Run Relationship Between Public Investment And Private Income
- Perceptions Of Cryptocurrency Among Undergraduate Students Of Olabisi Onabanjo University
- Lending Rate, Exchange Rate And Household Consumption Relations In Sub-Saharan Africa: Mean Group Approach
- Effect Of E-Banking Tools On Fraud Detection In Nigeria Banking Industry, 2005-2021

Journal of Banking

© 2024 The Chartered Institute of Bankers of Nigeria

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise without the prior joint permission of the Publisher and of the Author.

EDITORIAL BOARD

1. **Professor J.U.J Onwumere, FCIB - Chairman**
   Professor of Banking/ Finance and Economic Development University of Nigeria, Nsukka, Nigeria
2. **Professor Olusesan Oliyide, FCIB**
   Professor of Business Law, Olabisi Onabanjo University, Ogun State, Nigeria
3. **Professor Binta Tijani Jibril**
   Professor of Economics, Bayero University, Kano, Nigeria
4. **Professor Phillip Olomola**
   Professor of Economics, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria
5. **Professor Ishola Rufus Akintoye**
   Professor of Accounting and Strategic Financial Management, Babcock Business School, Babcock University, Ogun State, Nigeria
6. **Professor Jonathan Aremu**
   Professor of International Economic Relations, Covenant University, Nigeria
7. **Professor Mohammed Amidu**
   Professor of Accounting and Finance, University of Ghana Business School, Legon, Ghana
8. **Dr. Baba Yusuf Musa**
   Director-General, West African Institute for Financial and Economic Management (WAIFEM)
9. **Professor Uwalomwa Uwuigbe**
   Professor of Accounting, University of Nizwa, Sultanate of Oman.
10. **Professor Cecilia Olukemi Yekini,**
    Professor of Accounting at Aston University, Birmingham, England, United Kingdom
11. **Akin Morakinyo, HCIB**
    Registrar/Chief Executive, The Chartered Institute of Bankers of Nigeria

Editor-In-Chief
Professor J.U.J Onwumere, FCIB
Professor of Banking/ Finance and Economic Development, University of Nigeria, Nsukka, Nigeria

Journal of Banking - **ISSN:2736-1772, Published in Nigeria by**
The Chartered Institute of Bankers of Nigeria (CIBN)
Bankers House, PC 19, Adeola Hopewell Street, Victoria Island, Lagos, Nigeria.
Tel: 234-1-2617674, 4617925, 4617924, Telefax: 4618930
E-mail: journalofbanking@cibng.org **Website**: http//www.cibng.org

EDITORIAL

Dear Esteemed Readers,

The Institute's Journal of Banking, Volume 12, No. 1 of 2024 focuses on six articles which provide a composite picture of Nigeria's financial, economic, and social dynamics, particularly as they pertain to growth, stability, and innovation. From the relationship between credit and SME growth to the perceptions of cryptocurrency among students, these studies delve into both traditional and emerging areas of economic activity. The first article, **"Does the Financial Sector Credit Drive Small and Medium Scale Enterprises Growth?",** interrogates the role of financial sector credit in the development of Small and Medium Enterprises (SMEs) over four decades. SMEs are critical to economic growth, especially in emerging economies like Nigeria. By examining data from 1981 to 2023, the study highlights the systemic importance of credit accessibility. This study underscores the need for tailored financial policies that enhance SMEs' access to credit, strengthen regulatory frameworks, and support capacity-building initiatives.

The second article titled" **Inflationary Trends and Interest Rate Nexus: A Causality Approach**" explores the causal relationship between inflationary trends and interest rates from 1981 to 2022. Rising inflation often leads central banks to raise interest rates to curb spending and stabilize currency values. This study is crucial in the Nigerian context, where inflationary pressures have historically undermined purchasing power and economic stability. By examining this relationship, the study likely sheds light on whether Nigeria's monetary policies have been effective in stabilizing domestic price levels. Understanding these dynamics is critical for designing interventions that balance economic growth with price stability. The author used Statistical Bulletin of the Central Bank as the source of data.

This edition also looks at the paper titled **"Long Run Relationship Between Public Investment and Private Income"**. Here, the authors examine how public investments impact private income over a 52-year period. This study posits those public investments —whether in infrastructure, education, or healthcare—serve as catalysts for private economic activity. Public spending on infrastructure, for instance, reduces transaction costs and attracts private sector investment. The findings are expected to affirm the Keynesian perspective that public sector investment drives private income by expanding capital stock.

The fourth article titled "**Perceptions of Cryptocurrency among Undergraduate Students of Olabisi Onabanjo University"** provides a micro-level analysis of societal attitudes toward cryptocurrency among undergraduate students at Olabisi Onabanjo University. By focusing on this demographic, the study addresses the increasing relevance of digital currencies to a tech-savvy, youthful population. Cryptocurrencies offer opportunities for financial inclusion but also raise concerns about regulatory oversight, volatility, and misuse.

The recommendation to integrate cryptocurrency studies into university curricula through the Core Curriculum and Minimum Academic Standards (CCMAS) is both timely and innovative. This step would prepare students to navigate the complexities of digital finance while encouraging the Nigerian government to implement comprehensive cryptocurrency legislation. The authors used a total number of two hundred and forty-nine (249) survey responses from the Google form questionnaire deployed as the source of data. The fifth paper titled **"Lending rate, Exchange Rate and Household Consumption Relations in Sub-Saharan Africa: Mean Group Approach**" investigates the intricate relationships between lending rates, exchange rates, and household consumption in Sub-Saharan Africa. Using the Mean Group Approach, this study contextualizes household economic behaviors within broader macroeconomic trends. High lending rates often reduce household

consumption by limiting access to credit, while exchange rate fluctuations can erode household purchasing power.This study's regional focus is significant, given the interconnectedness of Sub-Saharan economies and the shared challenges of inflation, currency instability, and debt.

The last article, **"Effect of E-Banking Tools on Fraud Detection in Nigeria Banking Industry, 2005–2021"**, examines the paradoxical role of e-banking tools like ATMs in fraud detection. While e-banking facilitates financial inclusion and convenience, it also exposes vulnerabilities in the banking system. The finding that ATM usage had a negative impact on fraud detection underscores the need for more robust cybersecurity measures and user education. This study provides a roadmap for strengthening Nigeria's banking industry through technological innovation coupled with enhanced fraud prevention strategies.

Finally, the articles offer critical insights into Nigeria's financial and economic systems. The studies collectively emphasize the interconnectedness of financial policies, economic behavior, and technological advancements.

I hope you find this reading insightful and enriching.

Professor J.U.J Onwumere, FCIB
Professor of Banking/ Finance and Economic Development
University of Nigeria, Nsukka, Nigeria
(Editor-In-Chief)

Table of Contents

DOES THE FINANCIAL SECTOR CREDIT DRIVE SMALL AND MEDIUM SCALE ENTERPRISES GROWTH? 1
Onyendi, Hilary Uchenna
Olaosegba, Agnes Ndidi

INFLATIONARY TRENDS AND INTEREST RATE NEXUS: A CAUSALITY APPROACH 27
Onyendi, Hilary Uchenna

LONG RUN RELATIONSHIP BETWEEN PUBLIC INVESTMENT AND PRIVATE INCOME 39
Opara C. C.
Onyendi Hilary Uchenna
Onuegbu Onyekachi

PERCEPTIONS OF CRYPTOCURRENCY AMONG UNDERGRADUATE STUDENTS OF OLABISI ONABANJO UNIVERSITY 61
Abdul-Azeez Adeniyi Alao
Oluwasegun Temitayo Odunsi

LENDING RATE, EXCHANGE RATE AND HOUSEHOLD CONSUMPTION RELATIONS IN SUB-SAHARAN AFRICA: MEAN GROUP APPROACH 87
Abayomi Toyin Onanuga
Sheriffdeen, Adewale Tella

EFFECT OF E-BANKING TOOLS ON FRAUD DETECTION IN NIGERIA BANKING INDUSTRY, 2005-2021 117
Eze, O. R.
Ogiji F. O.
Eze, N. G.
Ogbonna, E. U.
Sagbara, B. V.
Ibiam, C. I.
Nwogo, J. E.
Nwambeke, G. C.

DOES THE FINANCIAL SECTOR CREDIT DRIVE SMALL AND MEDIUM SCALE ENTERPRISES GROWTH?

****

Onyendi, Hilary Uchenna[1] & Olaosegba, Agnes Ndidi[2]

ABSTRACT

The study investigated the effect of financial sector credit on the growth of small and medium-scale enterprises (SMEs) in Nigeria for the period spanning from 1981 to 2023. While the role of the SMEs to economic growth is indispensable, these enterprises cannot survive without adequate financing. The major source of financing to these enterprises in from the financial sector The extent to which the financial sector finances has driven growth of the SMEs is inconclusive in literature. The objective of the study is to answer the question: does the financial sector financing to the SMEs driven the growth of such enterprises? The study adopted secondary data gotten from various issues of the Central Bank of Nigeria Statistical Bulletin. Both the descriptive (mean, mode, standard deviation among others) and econometric tools (the unit root test (URT), the correlation test, the autoregressive distributed lag ARDL co-integration test and the Granger causality test) were used for data analysis. Results indicated the existence of long run relationship between the there is a long run relationship between bank credits and the growth of the small and medium scale enterprises; taking together financial sector credit has not driven small and medium enterprises. This implies that the financial

[1] *Department of Banking and Finance, Michael Okpara University of Agriculture, Umudike, Nigeria*

[2] *Department of Capacity Building, Certification and Standards, The Chartered Institute of Bankers of Nigeria, Victoria Island, Lagos*

sector credit so far disbursed have not stimulated the needs of SMEs to enable them trigger growth of these enterprises. The recommendations among others include that lending and inflationary rate policies should be geared towards easy access to credit to the SSEs.

Keywords**:** Financial sector, small scale enterprises. Medium scale enterprises, financial sector credit

JEL Classification: **G21, O17.**

1. INTRODUCTION

Financial sector loans or lending or credit to the small and medium scale enterprises (SMEs) remains vital to the growth and sustenance of these enterprises as no business firm can survive without adequate financing. The role of small scale enterprises in driving the economy and stimulating economic growth is not debatable. The Central Bank of Nigeria (2019) asserts that this is anchored on their role of provision of employment, reduction of poverty level, income redistribution, increased productivity, achieving overall economic prosperity and others. The economies of developed and developing nations of the world have been driven by the contribution of these small scale enterprises. For instance the Industrial Revolution started through the small scale enterprises that later grew to large scale industries.

It is therefore arguable that if these enterprises growth is sustained, the gross domestic product will be stimulated, drive the economy and bring about the much desired development; tool for the desired industrialization especially, now that emphasis is being shifted to economic diversification. Aremu *et al* (2011) found similar evidence that SMEs are vital agent for the creating job opportunities, and reducing poverty

One foremost way of promoting SSEs is by having easy access to finance. Finance is of high importance to the growth of SMEs. Afolabi (2013) observes that the major problem of the small and medium scale enterprises SMEs is financial constraint.

The World Bank (2001) reported that 39% of the small scale enterprises and 37% of the medium scale enterprises in Nigeria are financially constrained. In view of this report, it has been established that the financial sector (basically commercial banks) have risen to the challenge in providing financial succor to support the growth and output of the enterprises in Nigeria. No doubt the monetary authorities have at various times mandated the commercial banks to reserve a part of their loan facility to the SMEs.

This is buttressed by Osoba (1987) who argued that financing strength is the main determinant of small and medium enterprises growth in developing countries. However in the recent times evidence has shown that the commercial banks have taken steps to tackle and ameliorate this major limitation. However to the extent commercial banks credit has stimulated the growth of these enterprises over the years remains a subject of debate. This is so as some of these SMEs have experienced high level of mortality over the years. This study therefore is set to investigate if these credits have been used to achieve this growth of the SSEs over the years in Nigeria.

Government will find the findings of this study very significant now more than ever. The findings of the research will provide government and the monetary authority with yet another source of policy formulation and implementation. It will arm the government with policy towards the direction of boosting the growth and sustenance of the SSEs through financial sector financing.

The study cannot be of enormous significance than such a time that efforts are geared towards shifting emphasis from crude oil to other means of foreign exchange. In the face of dwindling crude oil prices and global crude oil crash, the contributions of the SSEs remains vital to driving the economy and place the nation on the verge of industrialization.

There appears to be limited empirical studies on the efficacy of credit schemes ; also three exists scarce studies on the role of financial sector reforms in trigger access of financial sector credit to the SMEs; while earlier studies dealt on aggregated SMEs with bigger enterprises thereby showcasing the unique problems faced by the SMEs. This study fills these

gaps in literature. This is by way of providing evidence on how the financial sector credit affects the growth of the SMEs.

The rest of the paper is organized as follows- following the introduction in section 1 is the literature review in section 2. Sections 3 and 4 are the methodology, results and discussions. The paper is concluded in section 5 with conclusion and recommendations.

2. LITERATURE REVIEW

The definition and classification of an enterprise as small scale or medium scale enterprises is dependent on the level of development of the particular economy. This is because what is small scale enterprise in one country may be a medium scale in another country. In Nigeria, the National Council of Small and Medium Enterprises Industries Equity Investment Scheme (SMEIS) in (2001) defines small scale enterprises as enterprises with labor force of between 11 to 100 workers, and total capital employed of not more than 50 million Naira including working capital but excluding cost of land. Similarly the medium scale enterprises MSEs are those with labor force of between 101 to 300 workers, and total capital employed of between 50 million Naira and 200 million Naira including working capital but excluding cost of land. Also the Small and Medium scale Enterprise (SMEs) are those with total capital employed of not less than 1.5 million Naira but not exceeding N200 million including working capital but excluding cost of land and with a staff strength of not more than 300.

There are factors that militate against the efforts of the commercial banks to lend to the SSEs. These factors can be categorized into two- the internal and external factors. The internal factors are factors that stem from the commercial banks themselves. The commercial banks mainly concentrate their branches in the urban area. Most of the branches are not found in the hinterlands. This makes it difficult for the SSEs to have access to the credit even when available. The branch network of the commercial banks branches are skewed to the urban areas, while the majority of the SSEs are concentrated in the rural areas. Another internal factor is that some of

the banks are not favorably disposed to lending to the SSEs. The reason being that SSEs repayment ability is low and thus lending to the SSEs remains unattractive to the banks. Rather banks prefer lending to the big companies and conglomerates that promise high turnover. Furthermore, the requirements and conditions of banks to the SSEs for obtaining loans sometimes are very stringent. Some of the SSEs most times cannot meet such conditions and so denied the opportunity to access the credit. The external factors are those that are outside the control of the banks. The banks are regulated by the Central Bank of Nigeria. The central bank periodically issues policy and monetary guidelines to control and regulate the operations of the commercial banks. These policy issues are based on the policy that the monetary authorities want to achieve. These policies are in the form of monetary and fiscal policies. The monetary policy instruments used by the central bank to regulate the quantity of money supply in the economy also affect the ability of commercial banks to lend and extend credit to the entire economy. Some of the tools of monetary policy are the reserve requirements (required reserve ratio RRR), rediscount rate or bank rate, liquidity ratio, and open market operation.

The *a priori* expectation of the study is that the commercial banks credit to the small scale enterprises should positively and significantly affect the output and performance of the small scale enterprises in Nigeria.

Relationship between Financial Sector and SME Growth

Various studies have been conducted by researches on the impact of bank credit on the small and medium scale enterprises. While some found that banks credit and financing remain vital to the activities of the small and medium scale enterprises, others indicated that bank credits to the SMEs has significant or insignificant effect on the Nigeria economic growth , also others found evidence that SMEs are pivotal in the growth and development of the economy. Imoughele *et al* (2014) investigated the impact of commercial banks on the small and medium scale industries in Nigeria for the period spanning from 1986 to 2012. The study adopted the co-integration and error correction model technique. Findings suggest that SMEs and selected macroeconomic variables included in the model are co-integrated showing a long run relationship between them. It

recommended that interest rate on credit facility granted to SMEs should be reduced and soft loans devoid of stringent conditions should be granted to the SMEs. Imafidon *et al* (2014) studied the role of commercial bank loan to SMEs in economic growth in Nigeria. They adopted the co-integration approach to analyze annual time series data from 1993 to 2012. The findings indicated that commercial bank loan does not contribute to Nigerian economic growth. The study attributed poor contribution of SMEs sector to economic growth to the inability of firms to source fund from banks. Ofoegbu *et,al* (2013) employed Pearsons correlation and Logit regression techniques to analyze the contextual factors that affect the performances of 140 selected SMEs in Nigeria. They identified availability of capital, access to raw material, power supply, access to market and enabling business environment promote the growth of SMEs while government polices and the poor state of the economy were inimical to the growth of SMEs.

Bassey *et al* (2014) employed Ordinary Least Square techniques to analyze the relationship between bank lending and the growth of SMEs from 1992 to 2011. The Augmented Dickey-Fuller ADF test affirmed that all the series were stationary at level. The study revealed that commercial banks credit and industrial capacity utilization exhibited positive and significant impact on SMEs growth in Nigeria. Illoh *et al* (2015) studied the relationship between the commercial bank lending and credit indicators and availability of credit facility to SMEs in Nigeria. Studying for the period from 1980 and 2010, it adopted the generalized least squares estimation techniques. The results indicated that the commercial banks credits to the SMEs have significant effect on the Nigeria economic growth by positively affecting the gross domestic product. The implication of the finding is that the SMEs are great catalysts and driving force for economic growth. The study recommended that the short and soft term loans should be made available to SMEs for further growth.

Dada (2014) found that the access to credit is crucial for the growth and survival of the SMEs. Utilizing data for 1992 to 2011 and adopting Ordinary Least Squares OLS regression method, it found that commercial bank credit to the SMEs, savings and time deposits of commercial banks

exert a positive significance on the SMEs development while exchange rate and interest rate has adverse effect on the SMEs development. It recommends that commercial banks lend more to the SMEs at subsidized rate.

Mamman and Aminu (2013) investigated the effect of 2004 banking reforms on loan financing of SMEs in Nigeria. A sample size of 500 was randomly chosen and chi-square test provided analysis on the survey data. The study indicated that there is no significant effect of 2004 banking reform on loan financing of SMEs in Nigeria. The study in its suggestions opined that there are some constraints which restricted access to loans from the banks for SMEs in Nigeria.

Aliyu and Bello (2013) examined the contribution of commercial banks to the growth of SMEs in Nigeria between 1980 to 2009. Using ratio analysis and trend analysis, it was discovered that commercial banks contribute to financing SMEs but their contribution has declined as the government through CBN directives abolished the mandatory bank's credit allocations.

Omah, *et al* (2012) examined the impact of post-bank consolidation on the performance of SMEs in Nigeria, with special reference to Lagos State. A sample size of 50 was drawn from the supra-population of the study within Ikeja Local Government in Lagos State. Applying mean, standard deviation and coefficient of variation in its data analysis, the study revealed that SMEs do not have better access to finance through banks, due to neo-reorganization in banks as a result of post-bank consolidation and SMEs do not have absolute rapport with the financial institutions due to their financial background in Nigeria.

Ahiawodzi and Adade (2012) examined the effect of access to credit on the growth of SMEs in the Ho Municipality of Volta region of Ghana by using both survey and econometric methods. The survey involved a sample of 78 SMEs in the manufacturing sector. Both the survey and econometric results showed that access to credit exerts a significant positive effect on growth of SMEs in the Ho Municipality.

Chiou, *et al* (2011) examined how diversified operations of banks impact their loans to SMEs by using panel data on 28 banks. The result indicated that as aggressive derivatives traders, the impact of its total assets on SMEs loans is positive at 1% significance level and credit guarantees positively impact SME loans at 1% significance level, implying that large banks are encouraged to make loans to SMEs through the assistance of the credit guarantees scheme.

Amonoo, *et al* (2003) investigaed whether there is a relationship between interest rates and the demand for credit as well as interest rates and loan repayment by the poor and the SMEs in Ghana. The results showed a negative relationship between interest rates and demand for credits as well as interest rates and loan repayment. The study suggested that lowering interest rates would increase the poor and SMEs demand for credit and loan repayment at banks and non-bank institutions which can be achieved through the amendment of the fiscal policy by the government.

Nwosa *et al* (2013) studied the impact of bank loans on manufacturing output in Nigeria from 1992 to 2010. Using the error correction method, the study found that the commercial bank credit to the SMEs has significant impact on manufacturing output both in the long run and the long run. Further finding however revealed that commercial bank loans to the SMEs have not been impressive.

However other studies have found out that commercial bank loan to the SMEs have not been impressive. Such studies include CBN (2010), Luper (2012), Pranti *et al* (2006) , Obamuyi (2007), Beck *et al* (2005), Taiwo *et al* (2012).

Nagaya *et al* (2017) studied the impact of SMEs on economic growth using dataset for India. The study found that the small and medium scale enterprises activities are growth -enhancing through various channels such as employment, poverty reduction and others.

Chinweuba (2015) investigated the relationship between SMEs and economic growth in Nigeria. The study found that SMEs activities can

enhance growth and development through the output expansion and other means of survival.

Some studies also investigated the availability of finance as a major problem militating against the growth and development of the SMEs especially in the developing countries. They include Bekele *et al* (2015) and Cravo *et al* (2009).

Theoretical Review

The study is based on the demand – following hypothesis and the supply-leading hypothesis. Patrick (1966) identified the direction of causality as demand - following and the supply- leading hypothesis.

The supply – leading hypothesis posits that financial development drives or leads or causes economic development , that is to say that as financial services, institutions and markets are created and increasing. This therefore stimulates economic growth. This implies that bank credit to the SMEs is vital to stimulate these enterprises and therefore drive growth.

On the other demand-following hypothesis opines that economic growth and development leads to financial development. In other words as the economy grows in the long run, increase in the demand of financial services drives expansion and development in the financial sector. Therefore the contributions of the SMEs will drive growth in the economy and trigger financial development.

The hypothesis is most relevant and applicable to the study in achieving the objective, rejection or acceptance of the null hypothesis and proffering solution to the problem of the study.

3. METHODOLOGY AND PROCEDURES

3.1 Methodology

Employing the Nigeria data ranging from 1981 to 2023, the study ascertains the effect of financial sector credit on the growth of SMEs. Data is collected through secondary sources – statistical bulletin of the Central Bank of Nigeria CBN of various issues.

The tool adopted is the Ordinary Least Squares (OLS) time series data. We adopted the Augmented Dickey Fuller unit root test for two reasons- first to ascertain if the variables have unit root, and to determine if the series have different order of integration, that is I(0) and I(1), different order. However if the series are integrated in the same order or integrated in the I(2) the ARDL cannot be adopted. Then if the series are found to be integrated in different order the Auto Regressive Distributed lag (ARDL) is performed to ascertain if the variables are co- integrated. Finally, the Granger causality test was employed.

The explanatory or independent variables are Commercial banks credit to small scale enterprises represented as CBCS, Commercial banks credit to private sector denoted by CBCPS, Commercial bank lending rate denoted as CBLR and Inflation rate represented by InfR. The independent variable is the Wholesale and retail output as component of the GDP denoted by SSEP (small scale enterprises performance and output)

Commercial banks credit to small scale enterprises represented as CBCS. It is the total credit by the commercial banks to the SSEs. It forms a major part of the finances of the SSEs over the years.

Commercial banks credit to private sector CBCPS is the loans and lending to the private sector. It is the total component of credit to entire economy less lending to the public sector. It also includes the loans to the SMEs. Therefore the loans to the SSEs are incorporated in the CBCPS. This loan is majorly used for investment and consumption purposes.

Commercial bank lending rate CBLR is the cost of credit. This is the price paid for obtaining the loan. It is usually designated as a particular percentage of the total credit payable annually or monthly or periodically according the terms of the loan. The higher the rate, the more repayment by the borrower. It is pertinent to note that this rate is paid from the profits of the SSEs. Therefore if it higher the profit and performance of the SSEs will be drastically affected

Inflation rate InfR is the sustained rising trend in the general level of price. During inflation, the borrowers (small scale enterprises) gain at the

expense of the lenders (commercial bank). Although the debtor repays the same amount of money that he borrowed in absolute terms , the creditors real value is decreased as the value of money falls. On the other hand, the interest rate is paid by the small scale enterprises from the profits they make from their businesses thereby reducing their profit. Therefore it is expected that inflation will have both positive and negative effect on the output of the small scale enterprises.

Wholesale and retail output as component of the GDP representing the small scale enterprises performance (SSEP) is the dependent variable. It represents the contributions of the industries to the GDP. It is one of the components of the GDP. Various authors have proxy the wholesale and retail output for the output and performance of the SMEs.

The following augmented model is estimated

$$L\Delta LSSEP = \beta_0 + \beta_1 LCBCE + \beta_2 LCBCPS + \beta_3 INF + \beta_4 LLR + t \quad \ldots (1)$$

where,

SSEP is wholesale and retail output (proxy for growth of the SMEs), CBCE is the banks credit to the SMEs, CBCPS represents banks credit to the private sector , Inf is the proxy for inflation, LR is used to depict lending rate, L = log , β_0 = constant, β_1, β_2 = explanatory power of the variables, t = stochastic error term.

3.2 Procedures

Both the descriptive and the statistical statistics were adopted for analysis. The mean, median and standard deviation among others were used for descriptive statistics. The unit root test, correlation test and ARDL are adopted for econometric analysis. First we ascertain if the variables have unit root by performing the Augmented Dickey Fuller ADF unit root test URT to. This is to avoid the simultaneity bias associated with the time series data. The ADF will depict if the series are of the same order or different order of integration. If some of the variables have different integrating order we now test for co integration (for long run relationship) using the auto regressive distributed lag.

Correlation Test

Correlation analysis tests the relationship existing between a pair of variables. It ascertain if the relationship in strong, very strong, weak or very weak.

The auto regressive distributed lag (ARDL)

In the time series domain, ARDL co integration bounds can be used to find the long run relationship among variables which are mixed such as some are stationery at level and some are stationery at first difference. Pesaran & Shin (1990) and Pesaran et al (2001) opines that "the ARDL co-integration technique is used in determining the long run relationship between series with different order of integration".

The ARDL is a model for time series data in which a regression equation is used to predict current values of a dependent variable based on both the current values of an explanatory variable and the lagged (past periods) values of the explanatory variable. Cromwell et al (1994) opine that "in statistics and econometrics, a distributed lag model is a model for time series data in which the regression equation is used to predict the current values of the dependent variables".

The starting point of for a distributive lag model is an assumed structure of the form

$$Y_t = \alpha + W_0 \chi_t + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + W_n \chi_{t-n} + \in \quad \ldots (2)$$

Alternatively , the distributive lag model is

$$Y_t = \alpha + W_0 \chi_1 + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + \in \quad \ldots (3)$$

where, Y_t is the value at the time period t of the dependent variable y, α = the intercept term to be estimated, W_0 is the explanatory powers of the variables, χ_t = explanatory variable, W_1,W_2 are the lag weight, $\in$ = the error term

In the first equation, the dependent variable is affected by values of the independent variables arbitrarily in the past, so the number of lag model

weights is infinite and therefore the model is called the infinite distribution model. Conversely in the second and alternative equation there are only a finite number of lag weights, indicating an assumption that there is a maximum lag beyond which values of the independent variables do not affect the dependent variable. A model based on this assumption is called finite distribution lag model.

Decision rule is that if the computed F-statistic is greater than or above the upper band critical value, the null hypothesis (there is no co-integration among the variables) is rejected, (the variables are co-integrated). Conversely if the computed F-statistic is lesser than or below the lower band critical value, the null hypothesis cannot be rejected, (the variables are not co integrated). Also if the computed F-statistic falls within or between the upper band and lower bound critical value the result of the inference is inconclusive and depends on whether the underlying variables are of I(0) or I(1).

Granger Causality test- Pairwise Granger Causality Test

If it is discovered that series are co integrated, the standard Granger causality test is constructed. The test for Granger causality was performed by estimating equations in the form:

$$\Delta LSSEP_t = \sum_{i=1}^{m-1} \beta \, CBCE \, \Delta L_{t-1} + \sum_{i=1}^{m-1} \delta_j \Delta LSSEP_{t-j} + \varepsilon_t \quad \ldots \quad (4)$$

$$\Delta LCBCE = \sum_{i=1}^{m-1} \beta \Delta LSSEP_{t-1} + \sum_{i=1}^{m-1} \lambda_j \Delta LCBCE_{t-j} + \mu_1 \quad \ldots \quad (5)$$

where,

$LSSEP_t$ is the log of SMEs growth, $LCBCE$, is the log of financial sector credit to SMEs, that is, it represents the log of the other explanatory

variables that affect the SSEP (CBCE, CPCPS, INF, LR),; μ_1 is the white noise disturbance term; ε is also the white noise disturbance term.

The decision rule is thus; if probability = or > 0.05 , accept (do not reject) the null hypothesis, if probability < 0.05, reject (do not accept) the null hypothesis.

4. RESULTS AND ANALYSIS

Results

Table 1 Descriptive results

	SSEP	CBCE	CBCPS	INF	LR
Mean	75361.61	44530.65	5382649.	18.93714	22.55286
Median	56896.31	16217.88	896475.2	13.12500	22.46500
Maximum	200876.0	321123.0	22113344	72.80000	36.90000
Minimum	33405.00	2314.000	8572.000	5.400000	10.00000
Std. Dev.	43098.01	68099.59	7003499.	15.70441	6.129491
Skewness	1.419252	2.777436	0.964741	1.841231	-0.190179
Kurtosis	4.338858	10.27176	2.491713	5.718286	2.779245
Jarque-Bera	17.23689	146.5364	6.967198	36.66180	0.338459
Probability	0.000181	0.000000	0.030697	0.000000	0.844315
Sum	3165188.	1870287.	2.26E+08	795.3600	947.2200
Sum Sq. Dev.	7.62E+10	1.90E+11	2.01E+15	10111.76	1540.397
Observations	42	42	42	42	42

Source: Researcher's computation

The descriptive result is used to compare the statistical averages and standard deviations of the dependent and independent variables as to explain the theoretical relationship between the variables. Table 1 shows the mean values, standard deviation etc of the parameters. The average (mean) is 75361 for the dependent variable- (SSEP), 44530, 5382649, 18.93, and 22.55, for the explanatory variables - (CBCE, CBCPS, Inf, Lr) respectively. The variables dispersal from the mean (standard deviation) is between 43098.01 for the dependent variable, 68099, 7003499, 15.7 6.12and 18.21223 also for the explanatory variables respectively. The

variables also exhibit an asymmetrical distribution with long tail to the right depicting high positive skew as above zero having values of 1.4 for the dependent variable and 2.77, 0.96, 1.84, and -0.19 for the explanatory variables .respectively. The probability of zero of the variables also explains relationship. The values of the kurtosis which quantifies whether the shape of the data of the distribution matches that CBCS and Lr exhibit leptokurtic while SSEP, CBCE and inflation are platykurtic.

Interestingly, all the variables showed reasonable sigh of relationship except , of course ,some variables in few cases. While appreciating the fluctuating nature of the trends might have affected the normalcy of the variable distribution, we make theoretical case that such trends are likely to lead to causal relationship between the trade openness and financial development. However the claim is further subjected to further econometric tests for further confirmation or otherwise as depicted below.

Table 2 Unit Root test result

Variable	Intercept Only	Decision	Trend and Intersect	Decision
LSSEP	-4.59993	I(0)	-4.5486	I(1)
	(-3.6104)*		(-6.9773)*	
LCBCE	-3.6052	I(0)	-4.0199	I(1)
	(-2.9364)		(-4.2050)*	
LCBCPS	-0.0329	I(1)	-2.4784	I(1)
	(-1.6009)		(-4.2192)*	
LLR	-1.5899	I(0)	-2.8582	I(1)
	(-3.6055)**		(-4.1985)	
LINF	-3.1321	I(0)	-3.9161	I(0)
	(-2.5350)		(-3.2266)*	

Source: Researcher's computation

Results from the above Table indicate that the series are of mixed integration, the autoregressive distributed lag method is then adopted. In the above table, the series clearly show that the series are integration are in mixed order, some in I(0) while some are in I(1). Therefore the ARDL method becomes appropriate.

Table 3 Correlation test

	SSEP	CBCE	CBCPS	INF	LR
SSEP	1				
CBCE	0.7720	1			
CBCPS	0.9434	0.5648	1		
INF	-0.2293	-0.0795	-0.2770	1	
LR	0.5546	0.4006	0.5125	0.0984	1

Source : Researcher's computation

It is known that correlation analysis establishes the relationship existing between a pair of variables. Table 3 depicts the correlation results. From the results, CBCE exhibit strong positive relationship with SMEs growth. It implies that both moves together, hence as the CBCE increases, growth of the SMEs is triggered. The CBCPS shows a very strong positive relationship with SSEP while the rate of inflation depicts a weak negative relationship with SMEs growth. This means that as inflation increases, SMEs growth is hindered. Finally, lending rate shows strong positive relationship with the dependent variable.

Table 4 ARDL result

Dependent Variable: SSEP
Method: ARDL
Date: 10/04/23 Time: 10:39
Sample (adjusted): 1985 2022
Included observations: 38 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): CBCE CBCPS INF LR
Fixed regressors: C
Number of models evalulated: 2500
Selected Model: ARDL(3, 4, 3, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
SSEP(-1)	0.995453	0.211960	4.696422	0.0001
SSEP(-2)	-0.181570	0.281863	-0.644179	0.5258
SSEP(-3)	-0.366692	0.253912	-1.444170	0.1622
CBCE	0.086499	0.052462	1.648784	0.1128
CBCE(-1)	-0.052815	0.077570	-0.680872	0.5028
CBCE(-2)	0.092406	0.079244	1.166093	0.2555
CBCE(-3)	-0.151865	0.094478	-1.607407	0.1216

CBCE(-4)	0.224585	0.081983	2.739414	0.0117
CBCPS	0.000632	0.001060	0.595871	0.5571
CBCPS(-1)	0.001078	0.001126	0.957823	0.3481
CBCPS(-2)	-0.001777	0.001430	-1.242778	0.2265
CBCPS(-3)	0.003046	0.001167	2.609595	0.0157
INF	42.50608	53.16951	0.799445	0.4322
LR	2.852664	161.5189	0.017661	0.9861
C	20616.10	10487.49	1.965780	0.0615

R-squared	0.994533	Mean dependent var	79549.50
Adjusted R-squared	0.991205	S.D. dependent var	43230.90
S.E. of regression	4054.190	Akaike info criterion	19.74027
Sum squared resid	3.78E+08	Schwarz criterion	20.38669
Log likelihood	-360.0651	Hannan-Quinn criter.	19.97026
F-statistic	298.8638	Durbin-Watson stat	1.960608
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Researcher's Computation

The R-squared value 0.99 and adjusted R squared of 0.99 shows that only 99 per of SMEs growth is accounted for by financial sector credit. This confirms significance of the explanatory variable to drive the dependent variable.

The coefficient of the explanatory variable CBCE having insignificant positive value of 0.08 has insignificant effect on SMEs growth having a probability of 0.11. This implies that the CBCE have a positive insignificance on SMEs growth. With regards to CBCPS which has a coefficient value of 0.0006 is insignificant having a probability of 0.55 greater than 5% level of significance. This depicts that CPCPS has a very low positive insignificant effect on SMEs growth. For inflation rate, the coefficient of 42.5 and probability of 0.43 show positive effect on SMEs growth although insignificantly. For lending rate with coefficient of 2.8 and a probability of 0.98 depicts positive insignificant relationship on SMEs growth.

Furthermore we test for the existence of a long run relationship between the dependent variable and the explanatory variables. This is done by using the Wald test that all the coefficients of the variations in levels are

equal to zero. We draw a comparison between the estimated F-statistics with bounds and the F-critical or tabulated value. The 50%, 95%, 99% bounds critical F- value test bands for k=6 are (2.960-3.79), (3.12-4.25), (3.93-5.23) for model with both constant and trend. The calculated F-statistic is 298. This is greater than the bounds F- critical test. This indicates existence of a long-run relationship between the SMEs growth and financial sector credit.

For the short run relationship, for there to be a long run relationship among the variables, the coefficients of the variables must be negative and also be significant at 5% level of significance. Using the one –lag period, the results depicts that all the lagged variables are insignificant at 5% level. From the above, we conclude the existence of long run relationship between the explanatory variables and the dependent variable in the long run and not in the short run.

Table 5 Pairwise Granger Causality Result

Null Hypothesis	F- statistic	Probability	Decision	Type of causality
LCBCE≠> LSSE	0.3983	0.6744	Not Rejected	No Causality
SSEP≠> LCBCE	3.8703	0.0303	Rejected	Causality
LCBCP≠> LSSE	0.9063	0.4133	Not Rejected	No Causality
L SSE≠> LCBCP	8.8692	0.0008	Rejected	Causality
LLR≠> LSSEP	0.2987	0.7435	Not Rejected	No Causality
LSSEP≠ > LLR	0.8951	0.4177	Not Rejected	No Causality
LINF≠> LSSEP	0.0864	0.9173	Not Rejected	No Causality
LSSEP≠> LINF	1.0446	0.3625	Not Rejected	No Causality

Source: Researcher's computation

Table 5 depicts the Pair-wise Granger Causality Tests. The test depicts interesting results. The probability of the causality from CBCE to SSEP

is 0.67 which is greater than 0.05 depicting no causality. Conversely the probability of the causality from SSEP to CBCE which is (0.03) is less than 0.05 showing causality. Therefore SSEP has triggered CBCE. The conclusion is that there is a unidirectional causality between the financial sector credit and the SMEs growth running from SSEP to CBCE. This implies that commercial banks credit have not driven SSE growth rather the reverse is the case.

The probability of the causality from CBCPS to SSEP is 0.41 which is greater than 0.05 depicting no causality. Conversely the probability of the causality from SSEP to CBCPS which is (0.008) is less than 0.05 showing causality. Therefore SSEP has triggered CBCPS. The conclusion is that there is a unidirectional causality between the financial sector credit and the SMEs growth running from SSEP to CBCPS.

The probability of the causality from LR to SSEP is 0.74 which is greater than 0.05 depicting no causality. Also the probability of the causality from SSEP to LR which is 0.41 is not less than 0.05 showing no causality. Therefore SSEP has not triggered LR nor LR affected SSEP. The conclusion is that there is no causality between the lending rate and the SMEs growth.

Finally, the probability of the causality from inflationary rate to SSEP is 0.91 which is greater than 0.05 depicting no causality. Also the probability of the causality from SSEP to Inflation which is (0.36) is not less than 0.05 showing no causality. Therefore SSEP has not triggered CBCE. There is no causality between inflationary rate and SSEP.

The findings are that

1. There is a unidirectional causality between the financial sector credit and the SMEs growth running from SSEP to CBCE.
2. There is a unidirectional causality between the financial sector credit and the SMEs growth running from SSEP to CBCPS
3. There is no causality between the lending rate and the SMEs growth.
4. There is no causality between inflationary rate and SSEP.

5. There is a long run relationship between bank credits and the growth of the SMEs. Since the calculated F-statistic is 298. This is greater than the bounds F- critical test. This indicates existence of a long-run relationship between the SMEs growth and financial sector credit. This corroborates the findings of Imoughele *et al* (2014).

4.1 Discussions of findings

Taking together, the financial sector credit has not driven small and medium scale enterprises growth in from Nigeria within the reviewed period. The findings corroborate that of Luper (2012), Pranti *et al* (2006) , Obamuyi (2007), Beck *et al* (2005), Taiwo *et al* (2012).

A unidirectional causal relation between financial sector credit and the SMEs growth running from SSEP to CBCE is not surprising. The ability of SMEs accessing loans from banks is indeed difficult. Bank branches are mostly in the urban areas. .

A unidirectional causality between the financial sector credit and the SMEs growth running from SSEP to CBCPS further pinpoints the arduous nature of insufficient credit from the sector to the SMEs.

The finding on no causality between the lending rate and the SMEs growth implies that lending rate is high and this is impedes the loan and credit disbursement to the SMEs..

Financial that there is no causality between inflationary rate and SSEP suggests that soaring inflation rate discourages lending and even when such lending is granted, the real value of the loans is reduced by inflation.

5. CONCLUSION AND RECOMMENDATION

Conclusion

We used Nigerian data from 1981 to 2023, to answer the question: has financial sector credit driven the growth of SMEs. Data is collected through secondary sources – statistical bulletin of the Central Bank of Nigeria CBN of various issues. The descriptive statistics, URT, correlation test, ARDL and Granger causality tests were used. The financial sector credit has not driven SMEs.

Policy Implication

The lending rate and inflation rate have not driven SME growth. The reason is not far-fetched. These rates are so high and have impeded access to credit and when eventually such credit are gotten, high rise in price level worsens the real value and makes repayment difficult. Hence financial sector credit have not driven growth of SMEs

Recommendation

The Central Bank of Nigeria should -

i) There should be an easy access of credit to the SMEs. More commercial bank branches should be established in the rural areas to facilitate the lending to the SMEs that are majorly located in the rural areas.
ii) The lending rate to the SMEs should be reviewed.
iii) The inflation rate should be should be reduced to a bearable single digit to enhance the performance of the SMEs.
iv) Encourage banks to lend to the SMEs.

REFERENCES

Ahmed A D., (2006)"The impact of Financial liberalization policies- the case of Botswana ", Journal of African development, vol 1, no1, p 13-38.

Afolabi (2013) Growth effect of SMEs Financing in Nigeria, Journal of African Macroeconomic. Review, 31 (2): 401-441

Ahiawodzi, A.K. &Adade, T.C. (2012). Access to Credit and Growth of Small and Medium Scale Enterprises in the Ho Municipality of Ghana. British Journal of Economics, Finance and Management Sciences, 6(2), 34-51..

Akingunola, R. O. (2011). Small and medium scale enterprises and economic growth in Nigeria: An assessment of financing options. *Pakistan Journal of Business and Economic Review*, 2(1).

Alawe T. (2004) Entrepreneurship Processes and Small Business Management. Industrial. Science Centre, Owoyemi House, Abeokuta road Sango Otta Ogun state, Nigeria

Aliyu. S.M and Bello G.B., (2013). An assessment of the contribution of commercial banks credit to the growth of SMEs in Nigeria. International Journal of Research in Social sciences. 2 (8):47-55

Amonoo, E., Acquah, P.K. &Asmah, E.E. (2003). The Impact of Interest Rates on Demand for. Credit and Loan Repayment by the Poor and SMEs in Ghana (IFLIP Research Paper 03-10). Geneva: International LabourOrganisation.

Aremu M . A., and Adeniti, S.L (2011) SMEs survival as a strategy for employment generation in Nigeria. Journal of sustaining development 4(1) : 25-37

Ariyo, D. (2005), Small firms are the backbone of the Nigerian economy. Accessed August 14,

2009 from www.africanecbonomi canalysis.org

Bassey, N. E., Asinya, F. A., & Amba, E. A. (2014). Bank lending, macro-policy variables and the growth of small scale industries in Nigeria. *International Journal of Business and Social Science,* 59(1), 284 – 290.

Beck, T. (2007) Financing constraints of SMEs in developing countries: evidence, determinants and solution. Journal of International money and Finance 31(2):405-441

Beck T., Demirgue- Kunt, A., and Levine ,R. (2005) SMES growth and poverty reduction. NBER working capital paper nu. 11224

Beck T., Demirgue- Kunt, A., andMaksimora, V., Financial and Legal constraints to firms' growth- does firm's size matter? Journal of Finance 60: 137-177.

Bekele, T and Zekele ,W., and (2008) Factors that affect the long term survival of of Micro, small and medium enterprises iin Ethiopia. South Arican Journal of Economics, 76(3)"1- 33

Central Bank of Nigeria CBN (2010) Annual Report and Statement of Accounts. December, Abuja. Central Bank of Nigeria.
Central Bank of Nigeria CBN (2018) Statistical Bulletin, vol.1. December. Abuja: Central Bank of Nigeria.

Central Bank of Nigeria (CBN) (2019).Statistical Bulletin.Vol. 17 December, Abuja. Central Bank of Nigeria, CBN Briefs (various Issues). Central Bank of Nigeria.Annual Report and statement of Accounts. Various Issues.

Chinweuba, E.T, Sunday, T.A., (2015) Quantitative analysis of the impact of small and medium scale enterprises in the growth pof the Nigeria economy-1993 – 2011. International Journal of development and emerging economies, 3(1): 26-38

Chiou, J., Wu, P. & Huang, B. (2011). How Derivatives Trading Among Banks Impacts SME. Lending. Interdisciplinary Journal of Research in Business, 1(4), 1-11. [6]

Cravo, T.A., Gourlay, A., and Berker, B., (2009) SMEs and regional economic growth in Brazil.

Working Paper2010-01

Dada, R.M. (2014) Commercial Bank credit and SMEs development in Nigeria- An empirical review. International Journal of research, 1 (18): 305-319

Illoh, J and Chioke , N (2015) Commercial banks credit availability to SMEs in Nigeria: A paper presented at the 3rd International Conference of Business Law and Corporate Social Responsibilty hela in Bali, Indonesia. 5-6 May.

Imafidon, K., & Itoya, J. (2014). An analysis of the contribution of commercial banks to small scale enterprises on the growth of the Nigeria economy. *International Journal of Business and Social Science*, 5(9, 1), 256 – 263.

Imoughele L.E., and Ismaila, M., (2014) The impact of Commercial Bank credit to the growth of SMEs – An econometric evidence for Nigeria 1986-2012. Journal of Educational policy and Entrepreneurial research 1(2):251-261

Lucy, T. (1988) Quantitative Technique. ECBB Series, #rd Edition.

Luper, I. (2012) Does bank size matter to SMEs Financing in Nigeria? International Journal of Business and Management 2(3): 2-5

Mamman, A. &Aminu, K.S. (2013). Effect of 2004 Banking Reforms on Loan Financing of Small and Medium Scale Industries in Nigeria. International Journal of Small Business and Entrepreneurship Research, 1(3), 44-53.

Mambula, C. (2002). Perceptions of SME growth constraints in Nigeria. *Journal Small Business Management, 40(1), 58-65.*

Muritala, A. T., Awolaja, A. M., & Bako, Y. A. (2012). Impact of small and medium enterprises on economic growth and development. American Journal of Business and Management.1 (1), 18 - 22.

Nagaya N., (2017) SMA Ipact on Output growth- case study of India Palma Journal 16 (13):11-17

Nwosa P E and Oseni I.O., (2013) The impact of bank loans to SMEs in Manufacturing output in Nigeria.Journal of Social development Sciences 4(5): 212-217

Obasan, K. A., & Arikewuyo, K. A. (2012). The effect of pre-post bank consolidation on the accessibility of finance to SMEs in Nigeria. *Journal of Business and Management Research*, 1(3), 108 - 120. doi:10.5430/bmr.v1n3p108

Ofoegbu, E. O., Akanbi, P. A., & Joseph, A. I. (2013). Effects of contextual factors on the performance of small and medium scale enterprises in Nigeria: A case study of Ilorin Metropolis. *Advances in Management and Applied Economics*, 3(1), 95 – 114.

Omah, I., Durowoju, S.T., Adeoye, A.O. &Elegunde, A.F. (2012). Post-Bank Consolidation: A Debacle in the Survival of SMEs in Nigeria "An Empirical Study". Australian Journal of Business and Management Research, 2(8), 1-6.

Schneider-Barthold, F. (2002), Africa's aborted industrialization, modernisation strategies impede organic industrial growth. D+C development and cooperation (No. 1, January/February, pp 15-17), Deutsche stiftung fur internationale entwicklung (DSE), Germany.

Taiwo, M.A., Ayodeji, A.M.,and Yusuf, B.A. (2012) Impact of SMEs on economic growth and development. American Journal of Business and Management, 1 (1):18-22. The World Bank (2001) World Bank Report, Washington DC. World Bank.

Dickey , O. A., and Fuller, D. (1981) "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root" Econometrica 251-276

Engle R. F. and Granger, C W J. (1987) Co integration and Error Correction: Representation, Estimation and Testing.Econometrice. 55,2, 51-76

Johansen, S (1991) "Estimation and Hypothesis Testing of Co integrating Vectors in Gaussian Vector Auto regression Models" Econometrica, Vol 50, pp 1551- 1580

Mackinnon, J.G., (1991) "Critical Values of Co integrating Tests", Long run Economic relationships: In, Engle R. F. and Granger, C W J. co integration Advanced Texts in Econometrics by Oxford University Press.

INFLATIONARY TRENDS AND INTEREST RATE NEXUS: A CAUSALITY APPROACH

****

Onyendi, Hilary Uchenna[1]

ABSTRACT

The study investigated the causal relationship existing domestic prices level rise and rate of interest in Nigeria from 1981 to 2022. In fact the causal relationship in the lending rate and inflation has generated a lot of inconclusive debate. High rate of interest is expected to drive low inflationary rates while high rate of inflation results in low rate of interest. This co-movement between the two variables has remained a topic of inconclusive debate in Nigeria. This study is set to determine this. The source of data is secondary obtained from the Statistical Bulletin of the Central Bank of Nigeria of various issues. The econometric tools used are the unit root tests, the co-integration test, the Auto regressive distributed lag (ARDL) and the Granger causality tests. Results indicate an existence of a long-run relationship between the dependent and independent variables. The findings depict a long run relationship between inflation and interest rate; there is a unidirectional causality between the consumer price index and interest rate running from CPI to interest rate; there is a unidirectional causality between the domestic prices and interest rate running from DOP to interest rate; there is no causality between the rate of exchange and interest rate running from CPI to interest rate; there is a unidirectional causality between the consumer price index and interest rate running from CPI to interest rate; there is no causality between inflation and interest rate. Taking together, consumer price index and domestic prices has influenced interest rate, inflation and

[1] Department of Banking and Finance. Michael Okpara University of Agriculture Umudike, Nigeria

exchange rate have not. This implies that high soaring rate of inflation and the volatile exchange rate are inimical to interest rate; consumer price index and domestic prices if monitored and remain stable remain ideal for a competitive interest rate. Recommendations include that inflation rate should be monitored to avoid undesirable levels that will its non-response to interest rate; the exchange rate, policies that will enshrine stability should be put in place; the consumer price index should be allowed to be determined by the forces of demand and supply to trigger equilibrium in the overall prices of consumer goods and services; local products, goods and services should be encouraged.

Keywords- Currency rate, Inflationary trend, floating exchange rate regime, devaluation.
JEL Classification: E31, E43

1.I NTRODUCTION

A foremost study on interest rate in 1930 by Irvin Fisher in the *Theory of Interest rate* found that present inflation rate that triggers interest rate respond slowly to past inflation. On the contrary study by Fama (1975) provided evidence that negates the aforementioned theory. Fama suggests that interest rate immediately and totally reflects inflationary expectations. These two views posit an inclusive debate. This debate is further a yawning gap in the Nigeria context within the reviewed period.

One of the most fascinating topics of discourse in the economy is the inflation and interest rate relationship. This relationship has drawn considerable attention of researchers especially in the emerging economies as movements in interest rate can affect and trigger rise in the domestic prices. Lucas, Alvarez, & Weber (2001) argue that interest rate and inflationary trends appear to co-move towards the same direction. This is so since interest rate are integral index for managing inflation by the monetary authorities; a veritable index for measuring the health or otherwise of an economy and its fluctuations raises concerns to the monetary authorities, regulators and the regulated.

Interest rate is the cost of borrowing. It is the proportion of credit or loan that is charged to service the debt payable to the lender by the borrower. It is usually expressed as a yearly percentage of the remaining loan. When the rate of interest is reduced, borrowers are encouraged to borrow. It is the amount charged against the borrowed amount and paid by the borrower.
Jhingan (1997) asserts that inflation is the general rise in the price level over a given time period. It can be cost-push or demand-pull. The former is when too few goods are been purchased with too much money; the latter is when high cost of production leads to high cost of goods and services. In recent time, in Nigeria, there have been noticeable high rate of inflation on one hand and continuous rise in interest rate.

The relationship between interest rate and inflation is that the higher the interest rate, the lower the rate of inflation. The causation is that low interest rate leads to a decrease in the cost of borrowing leading to high aggregate demand resulting to shortage of supply and higher inflation. Rising interest rate curbs inflation while low interest rate triggers inflation. A decrease in inflation implies that consumers spend more as there is cheap cost of goods and services since the cost of capital is low. Therefore the relationship exists between inflation and rate of interest. However in Nigeria it has been an inconclusive on whether inflation drives interest rate or vice versa. This calls for investigation.

The objective of the study is to determine the causal relation between inflation and interest rate.

The relevance and need for this study becomes more pertinent in view of concerns in research and policy; research for potential and foremost researchers; and policy initiative and implementation by the economic managers. The research interest is founded on the concern that very few studies, if any, have been done on Nigeria in this topic. Therefore further study on this subject becomes pertinent. The policy concern emanates from the belief that the findings of the study will no doubt present to the monetary authorities in Nigeria and beyond to further enhance the policy tool for the purpose of achieving stable exchange stability while still maintaining a

single-digit rate of inflation and or engender a more robust exchange rate stability and acceptable inflationary rate.

The rest of the paper is organized as follows- the Literature review in section 2, while section 3 is the methods and methodology, Sections 4 focuses on the results and analysis and 5 deals on recommendation and conclusion respectively.

2 REVIEW OF RELATED LITERATURE

Conceptually, economists opine that higher rate of interest culminates to lower inflation rates. It is argued that as the rates of interest or lending rate increases (depicting high cost of borrowing) influencing recession in the economy, it will result to excess supply thereby reducing rate of inflation.
Theoretically the Irvin Fisher's classical study in *The Theory of Interest rate* published in 1930 asserts that rates of interest during the period 1890 to 1927 responded slowly and incompletely to different levels of inflation. The may be put to suggest that inflationary expectations that affect the present rate of interest depict a slow response to past inflation observations. Higher rate of interest impedes consumption and stimulates saving; low interest rate triggers consumption and discourages savings since there is no need to save.
On the empirical stance, Bafekr (1998), factors driving inflation in Iran. Results indicated in the long run, that 10% increase in liquidity causes a 2.7% increase in retail inflation and 3.2% in wholesale inflation. Conversely, 10% increase causes production level retail price decrease to 1.7% wholesale prices by 2.4%. Also Dawodi (1997) investigated inflation process in three different time periods- short run, medium and long run. Results show that when liquidity is increased by 1%, there is 95% increase in inflation. Also 1% increase in the rate of exchange rate causes 0.301 increase in inflation .
Using a log-linear macroeconomic model of a typical open economy for ten countries, Gylfson and Schmidt (1983) found that currency devaluation was expansionary in eight out of the ten countries while devaluation was found to be contraction in the other two countries – the United Kingdom and Brazil.
Odusola and Akinlo (2001), investigated the relationship between exchange rate, inflation and output in Nigeria adopting a structural VAR that took care of the interactions between exchange rate and output. Findings suggest that in the short run there is a contraction impact of the parallel exchange rate on

output. Also prices, parallel exchange rate and lending rate were identified to be sources of perturbations of the official exchange rate. The study concluded the Central Bank should tame and regulate the parallel market operations and behavior through monetary policy formulation that will stimulate income and growth.

METHODOLOGY

The data for Nigeria from 1981 to 2022 is employed in order to ascertain if it the interest rate that drive inflation or vice versa in Nigeria. Secondary sourced data is gotten from the statistical bulletin of the CBN of various issues. The response variable is the rate of interest while the explanatory variable is the inflationary trend indicators (including consumer price index CPI, domestic price DOP, Inflation INF and exchange rate EXR). The tool adopted is the Ordinary Least Squares (OLS), the co-integration test, the autoregressive distributed lag test, and the Granger causality test.

The model for this study is of the form:

$$L\Delta\ LINTR = \beta_0 + \beta_1 LCPI + \beta_2\ DOP\ \beta_3 LExR + \beta_4\ INF + t \ \ldots \qquad \text{(i)}$$

where,

LINTR = interest rate, LCPI = consumer price index , LDOP is the domestic prices, LExR = exchange rate, LINF= inflation rate, L = log , β_0 = constant, β_1, β_2 = explanatory power of the variables, t = stochastic error term.

RESULTS AND DISCUSSION

Table 1 Unit Root test result

Variable	Intercept Only	Decision	Trend and Intersect	Decision
LINTR	-2.9457	I(0)	-3.5063	I(0)
	(6.9649)*		(-6.9773)*	
LCPI	-2.9321	I(1)	-3.5085	I(1)
	(-0.2438)		(-1.7654)*	
LDOP	-2.9251	I(1)	-3.5765	I(1)
	(1.92207)		(-0.3104)*	
LINF	-2.9500	I(1)	-3.5646	I(1)
	(-1.5639)		(-2.1541)	
LEXR	-2.9389	I(1)	-3. 5773	I(1)
	(7.3517)		(2.0126)*	

Source: Researchers Computation

For the unit root tests results - The Augmented Dickey Fuller unit root test depicts that the variables are integrated of order I(0) and order 1, that is, I(1) at 1%, 5% and 10% level of significance respectively as the case may be. Since variables are mixed where some are stationery at level and some are stationery at first difference, we adopt the Auto regressive Distributive Lag ARDL. In the time series domain, ARDL co integration bounds can be used to find the long run relationship among variables which are mixed such as some are stationery at level and some are stationery at first difference. Therefore we go a step further to employ the co- integration test procedures to test the co -integration among the variables.

Table 2 Correlation result

	INTR	**CPI**	**DOP**	**EXR**	**INF**
INTR	1				
CPI	0.6858	1			
DOP	0.6765	0.9943	1		
EXR	0.7155	0.9494	0.9548	1	-
INF	0.0832	-0.2259	-0.2617	-0.2383	1

Source: Researchers' Computation

Apart from inflation, all other variables are highly correlated to interest rate. The value of 8% for inflation show a weak association with interest rate.

Table 3 ARDL Results

Dependent Variable: INTR
Method: ARDL
Date: 10/31/23 Time: 10:49
Sample (adjusted): 1984 2022
Included observations: 39 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): CPI DOP EXR INF
Fixed regressors: C
Number of models evalulated: 2500
Selected Model: ARDL(3, 0, 0, 1, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INTR(-1)	0.402676	0.148664	2.708641	0.0114
INTR(-2)	0.005120	0.192263	0.026630	0.9789
INTR(-3)	0.521151	0.170517	3.056301	0.0049
CPI	0.149628	0.065769	2.275036	0.0308
DOP	-0.001219	0.000726	-1.678988	0.1043
EXR	0.044596	0.020625	2.162252	0.0393
EXR(-1)	-0.075947	0.031842	-2.385149	0.0241
INF	-0.029019	0.061287	-0.473504	0.6395
INF(-1)	-0.006104	0.062836	-0.097142	0.9233
INF(-2)	-0.116849	0.053231	-2.195111	0.0366
C	5.241685	2.955042	1.773811	0.0870

R-squared	0.796698	Mean dependent var	24.15795
Adjusted R-squared	0.724090	S.D. dependent var	6.587314
S.E. of regression	3.460127	Akaike info criterion	5.553233
Sum squared resid	335.2294	Schwarz criterion	6.022443
Log likelihood	-97.28804	Hannan-Quinn criter.	5.721581
F-statistic	10.97261	Durbin-Watson stat	2.127274
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Researcher's computation

There is a long run relationship between the explanatory variables and the observed variable. This is so since the value of the F-statistic has a probability value of 0.00 which is lesser than 0.05 value. CPI has positive significant effect on interest rate DOP depicts a negative insignificant effect on interest rate. Exchange rate has a positive significant effect on interest rate, while inflation depicts a negative insignificant effect on interest rate. In all the explanatory variables indicate insignificant effect on the interest rate

Table 4 Pairwise Granger Causality Result

Null Hypothesis	F- statistic	Probability	Decision	Type of causality
LCPI ≠> *LINTR*	3.4878	0.041	Rejected	Causality
LINTR ≠> *LCPI*	0.1352	0.874	Not Rejected	No Causality

LDOP≠> LINTR	3.4797	0.0418	Rejected	Causality
LINTR≠ > *LDOP*	0.1581	0.8543	Not Rejected	No Causality
LEXR ≠> *LINTR*	2.1941	0.1268	Not Rejected	No Causality
LINTR≠> LEXR	0.1645	0.8489	Not Rejected	Causality
LINF≠>LINTR	1.6023 3.1740	0.2171 0.05	Rejected Rejected	No causality No Causality
LINTR≠> INF				

Source- Researcher's computation using E-views 10 version

From the above table, while consumer price index with a probability of 0.41 which is lesser than 5 percent has Granger cause interest rate, there is no such influence on consumer price index by interest rate as its probability is 0.87 which is not lesser than 0.05. The same is for domestic price and interest rate. The later with a probability of 0.04 which is not higher than 0.05 has influenced the former and the reverse is the case for the former on the later as it has a probability not lesser than 0.05 with a value of 0.85. Neither exchange rate nor interest rate has affected each other. Both inflation and interest rate has not Granger cause each other. Both have probability greater than 0.05. The values are 0.12 for exchange rate and 0.84 for interest rate. None has triggered each other.

The findings depict a long run relationship between inflation and interest rate. There is a unidirectional causality between the consumer price index and interest rate running from CPI to interest rate; there is a unidirectional causality between the domestic prices and interest rate running from DOP to interest rate; there is no causality between the rate of exchange and interest rate running from CPI to interest rate; There is a unidirectional causality between the consumer price index and interest rate running from CPI to interest rate; there is no causality between inflation and interest rate.

Taking together, consumer price index and domestic prices has influenced interest rate, inflation and exchange rate have not. This implies that high soaring rate of inflation and the volatile exchange rate are inimical to interest rate; consumer price index and domestic prices if monitored and remain stable remain ideal for a competitive interest rate.

5. CONCLUSION AND RECOMMENDATIONS

The paper explored the causal relation existing between inflation rate and interest rate from 1981 to 2022 in Nigeria. High interest rate triggers leads to low rates of inflation as opined in literature, while high inflation results in low interest rates. This relationship remains inconclusive in Nigeria. The study employed the using the unit root test, the correlation test, the autoregressive distributed lag and the Granger causality tests for econometric analysis. Taking together the findings depict no causality between the rates of inflation and interest rate. This implies that both the Irvin Fisher theory and the Fama Theory are inapplicable in Nigeria within the reviewed period. In view of the findings some policy recommendations are proffered.

(I) The Central Bank of Nigeria (CBN) should be monitor and check rate of inflation to avoid undesirable levels that will induce its non-response to interest rate.

(II) With regards to the exchange rate, policies that will enshrine stability should be put in place. Demand and supply of foreign exchange should be matched to avoid shocks that may trigger the depreciation of the domestic currency.

(III) The consumer price index should be allowed to be determined by the forces of demand and supply to trigger equilibrium in the overall prices of consumer goods and services. Local products, goods and services should be encouraged while unnecessary imports should be minimized.

(IV) Domestic prices should be generally stable and predictable. Mono-product base economy should have no place in the policy initiatives rather diversification of the product base in the economy is the key.

(V) On its own, the lending rate adjustments should be done carefully by the CBN so as not trigger inflation.

REFERENCES

Akaike, H.(1973). Information theory and an extension of the Maximum likelihood principle. Second International Symposium of Information theory. Ed by Petrov, B.N and Casky, F. *Budapest,*

Bafekr, A., (1998). Investigation about causes of inflation in Iran with cointegration methods. Economics Department of ShabibBeheshti University, 1-37

Central Bank of Nigeria (2006). Statistical Bulletin.Vol. 17 December. Abuja. Central Bank of Nigeria Central Bank of Nigeria Annual Report and Statement of Accounts. Abuja. Various issues Central Bank of Nigeria (CBN) Economic and Financial Review. Abuja. (various issues)

Dickey , O. A., and Fuller, D. (1981) "The Likelihood Ratio Statistics for Autoregressive Timem Series with a Unit Root" *Econometrica* 251-276

Dickey , O. A., and Fuller, D. (1981) "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root". *Econometrica,* 251-276

Engle R. F. and Granger, C W J. (1987) Co integration and Error Correction: Representation, Estimation and Testing. *Econometrica*, 55 (2), 51-76

Fama, E.F., (1975). Short- term interest rates as predictors of Inflation, *American Economic Review*, 65, 269-282

Dawodi, P. (1997). Economic stabilization policy and estiamating dynamic inflation model in Iran, Research publication and economic policy, Tehran, Iran.

Gylfason, T and Schmidt, M. (1983) "Does devaluation cause stagflation?" Canadian Journal of Economics 16,4:641-54

Irvin Fisher. The theory of interest. Macmilan 1930 in

Jhingan M.L. (1997). Macroeconomic Theory. 11th ed. Delhi: Urinda Publication Ltd. 787pp

Johansen, S (1991) "Estimation and Hypothesis Testing of Co integrating Vectors in Gaussian. Vector Auto regression Models" Econometrica, Vol 50, pp 1551- 1580

Mackinnon, J.G., (1991) “Critical Values of Co integrating Tests”, Long run Economic relationships: In, Engle R. F. and Granger, C W J. co integration Advanced Texts in Econometrics by Oxford University Press

Lucas, R. E. Alvarez, F., & Weber, W.E.(2001). Interest rate and inflation. American Economic Review, 91(2): 219-225. DOI. 1257/aer.91.2.219. Source>RePEc

LONG RUN RELATIONSHIP BETWEEN PUBLIC INVESTMENT AND PRIVATE INCOME

****

Opara C. C.[1]; Onyendi Hilary Uchenna[2] & Onuegbu Onyekachi[3]

ABSTRACT

The study investigated the effect of public sector investment on the income of individuals in Nigeria for the period spanning from 1970 to 2022. Investments by the public sector attract further capital to the existing stock of capital and therefore are expected to trigger private income. However, this appears not to be so as poverty, hunger, unemployment, poor living standards ravage the economy over the years. The main objective of the study is to determine the effect of such government interventions in the form of investments on income of individuals within the reviewed period in Nigeria. The study adopted secondary data gotten from various issues of the Central Bank of Nigeria Statistical Bulletin. Both descriptive and econometric statistics were adopted for analysis. The mean, mode, standard deviation and others form the descriptive tools; the econometric tools include the unit root test (URT), the correlation test, the Autoregressive distributed lag (ARDL) and the Granger causality test. Results indicated the existence of a long-run relationship between the dependent variables and explanatory variables. Taking together the public investment has insignificant effect of personal income hence the prevalence of hunger, poverty and unemployment. This implies that the investment policies within the reviewed period have reduced personal income. Recommendations include that the Central Bank of Nigeria should initiate public investment reforms (such as improving capital formation) that will engender private income; also income lending rate,

[1-3] *Department of Banking and Finance, Michael Okpara University of Agriculture, Umudike, Nigeria*

exchange rate, inflation rates should be monitored by the Central Bank of Nigeria to desirable and favorable level that can boost personal income.

Keywords: Public investment, Per capita income, Personal income,
JEL Classification: F31, F40, F41

1. INTRODUCTION

Public investment implies the funding and allocating resources for projects and services that the private sector cannot successfully deliver on its own. These projects are usually large in scale which the private sector cannot normally get involved in them. The Organization for Economic Cooperation and Development (OECD) (2020) opines that public investment shapes choices about where people live and work; stimulates the nature and location of private investment and affects quality of life; it can boost growth by providing infrastructure to promote private investment, and thereby expected to boost the income of individual of a particular country.

Ghassami (1996) emphasizes that investment plays a tremendous role in economic advancement via productive capacity expansion. On the other hand, it may lead to waste of resources, erode public confidence, and limits growth. Public investments are in areas as roads construction, dams, education, sewage system, water and electricity, health. Ojong et al, (2018) assert that it reduces the unemployment rate by way of providing jobs; improves production base, and enhance income level and living standard of the populace. Meyer & Sanusi (2019) asserts that investment remains a veritable tool to combat poverty. By increased investment, there is a corresponding low unemployment, higher growth, more opportunities to be harnessed. Then if this is so, it is not unarguable that such investments should have a direct bearing on improving personal income.

The Central Bank of Nigeria (CBN) (2018) asserts that in Nigeria, government has made efforts to improve and increase the investment at its disposal with the aim of driving the economy in general and boosting private income in particular. It is not clear if such efforts have actually achieved the

desired objectives. This is so as private income seems to be deteriorating culminating to high poverty level among the majority of the people. For instance The National Bureau of Statistics NBS (2022) has disclosed that 133 million Nigerians are multi-dimensionally poor. In the latest National Multidimensional poverty Index report, the Nigeria Bureau of Statistics (NBS) said that 63 million Nigerians were poor as a result of lack of access to healthcare, education, living standards, employment and insecurity.
From the foregoing, public investment should drive capital accumulation therefore trigger private income. However in the Nigerian scenario, the private income appears to be decreasing as poverty, disease, unemployment is ravaging the country. This is a source of worry and calls for further investigation. In other words, despite huge public investments over the years, the per capita income appears to be low.

The paper is a radical departure from the previous studies that centered on the effect of public investment on economic development, gross domestic product (GDP) and growth. Such studies tend to be a broad approach as most of the findings depict robust and significant effect. Surprisingly, the robust effect of the international liquidity on the GDP has not manifested and reflected on the actual personal income of the average citizen as hunger, poverty, impoverishment, low per capita income, etc bite harder on the populace. Therefore this study is set to ascertain the effect of international liquidity on the income of an individual person in the country.

The research interest is founded on the premise/fact that very few of such studies, if any, has been done on Nigeria (conducted by Simatele, 2003). Therefore further study on this subject becomes imperative. The study contributes to literature in two ways. The recommendations will no doubt provide the policy makers with policy framework that will form a theoretical base for formulations and implementation of policies that will engender public investment on personal income. It will also be a focal point for future researches on public investment and per capita income (PCI) in emerging economies; while bridging the existing gap in literature on the policy implication of public investment and personal income in Nigeria.

The remaining part of the paper is the Section 2 and 3 containing the Literature review and methodology respectively; while section 4 is the results and discussions. The paper is concluded in section 5 with conclusion and recommendation

2. LITERATURE REVIEW

Conceptual Review

Public Investment

It increases the available stock of capital, this increases real output. Krishnamurty and Pandit (1985) suggest that there is crowding-in effect of public investment on private investment. The Keynesians opine that real investment is an addition or increment to the existing capital stock and therefore results to increment in the level of real income. Okereke (2015) asserts that investment is a profitable foregoing of present consumption which is only attained if the present initial capital outlay yields or generates more returns and benefits greater than the foregone benefits. Public investment is the totality of investments by the government for the benefit of the citizens. This will no doubt reduce poverty, hunger, unemployment and high cost living thus impact private income.

Private Income

This is the income of an average citizen from the Gross Domestic Product. It is gotten by dividing the GDP by the total population of the country. A higher private income implies economic prosperity in the economy. If this is low, it means that the economy is in depression hence, hunger, unemployment, high cost of living and poverty.

Studies by Duruechi and Ojiegbe (2015) , Ajayi and Kolapo (2018) concur that personal income is the per capita income of the individuals. It is the income per head of each individual person in the country. It is gotten when the gross domestic product is divided by the total population of the country. It is the share of a single individual from the total national output.

Relationship between public investment and private income

There are two basic channels by which public investment drives economic growth – efficiency and productivity. Efficiency entails the extent a given quantum of public investment provides in terms of physical infrastructure. Productivity involves the extent that the physical infrastructure has affected the economy. The Keynesians also opine that investment should trigger more capital thereby impacting on income. In summary, public investment is expected to drive capital accumulation which has a direct bearing on the GDP and therefore should trigger the personal income of the people.

The study has its *a prori* expectation that international liquidity policy should drive, trigger and have a positive effect personal income in Nigeria In order words, that the stability in the rate of exchange is explained by the quantum of international liquidity.

Theoretical Review

The Keynesian and Classical investment theories assert that interest rate and income drive investment. Investment is generally proxy and measured by the gross fixed capital formation. Keynes referred to investment as real investment that increases the existing capital stock thereby increasing the level of real income. It includes acquiring new plants, equipments, construction and building of roads, bridges, airports railways ant others. It encapsulates expenses on education, healthcare and others.

The theory is most relevant and applicable to the study in achieving the objective, rejection or acceptance of the null hypothesis and proffering solution to the problem of the study. Most importantly the theory supports the a priori expectation of the study that international liquidity .is expected to stimulate and improve the private income.

Empirical Review

Durechi and Ojiegbe (2015) in the study on investment determinants in the Nigerian economy from 1990 to 2013 found that decision to engage in investment or not in Nigeria are impeded by some factors. The study concluded that only government expenditure has significant effect on

investment in Nigeria. The m recommendation is that government should policy formulation on investment must be based on the full understanding of the factors driving investment so that economic growth can be expanded.

Ogu and Ojimadu (2019), studied investment and macroeconomic performance in Nigeria from 1980 to 2016 employing the Ordinary Least Square technique of multiple regression for data analysis. Results indicate that the gross domestic product positively impacts on investment. It recommends that government should design programs that will foster both local and foreign investors to invest in the country.

David, et al, (2020), uses the extended nonlinear ARDL co-integration approach examined determining factors of investment in Nigeria from 1980 to 2018. The bound test results indicated the presence of co-integration between domestic investment and the determinant variables. Also the factors driving investment in Nigeria in the short run are inflation, real interest and rate of exchange, government spending, power supply consumption, savings, per capita income, credit to private sector and interaction between government expenditure and oil prices; while in the long run inflation interest rate, rate of exchange, government expenditure, internal conflict, savings and the link between the oil prices affect investment. Suggestion of the study in view of its findings is that the government increase its capital expenditure , savings, diversification of the economy, reduction in the lending rate, reducing inflation, and curbing insecurity.

Ajayi and Kolapo (2018) investigated if the domestic private investment is sensitive to macroeconomic indicators in Nigeria from 1986 to 2015. The study adopted the OLS and Engle Granger causality techniques. Results indicate that there is a positive influence of GDP and exchange rate on domestic private investment, but the changes in money supply has a negative impact.

Gaps in literature

The study fills the gap that is already exists in literature. Studies such as Ogu et al (2019) studied investments and macro economic performance in Nigeria; Durechi and Ojiegbe (2015) studied the determinants of investment in Nigeria . Some other studies dealt on the effect of investment on the GDP. What is remaining that needs urgent research is the effect of public investment on the particular individual for whom such investment was actually made for. This study fills the by investigating the personal income has been improved from such public investments.

3. METHODOLOGY

Research Design

Yearly data covering the period from 1970 to 2022 for Nigeria was employed for analysis. Data sources were from the Central Bank of Nigeria CBN statistical bulletin of various issues. The dependent variable is private income represented as per capita income (PCI). The explanatory variables are the proxy for public investment depicted as – government expenditure (GEXP); gross fixed capital formation (GFCF); lending rate (LR); the controlled variables are inflation (Inf), and exchange rate (EXR). Inflation rate reduces the real value of income and exchange rate of the domestic currency in terms of creditor countries determines the real value of the investible foreign funds. The results of the tests is interpreted which forms the basis of the research findings and enable the recommendations to be proffered in the study.

The model for this study is of the form :

$$L\Delta\ LPCI = \beta_0 + \beta_1 LGEXP + \beta_2\ LGFCF + \beta_3 LInf + \beta_4\ LR + \beta_5 LEXR + t \quad \text{.....} \quad (1)$$

where,

LPCI = private income and the dependent variable; LGEXP the aggregate public expenditure, LGFCF is the log of gross fixed capital formation, LEXR = exchange rate, LInf = Inflation , LLR is the lending rate; the explanatory variables

L = log , β_0 = constant, β_1, β_2 = explanatory power of the variables, t = stochastic error term.

3.2 Estimation method

In order to achieve the objective of the study, the following tests were run; the descriptive statistics; the Augmented Dickey Fuller (ADF) unit root test (URT); the correlation test, the autoregressive distributed lag; and - Granger Causality test- Pair -wise Granger Causality Test.

Descriptive Test

The mean, mode, standard deviation , kurtosis and probabilities and other descriptive statistical figures were adopted to establish a relationship between the regressors and the regressed variables.

3.2 Econometric Tests

Unit root test

Generally, for time series tests, the ordinary least squares (OLS) statistic is employed. However, there is a shortcoming in this application as at times, the OLS can be linked to simultaneity bias and spurious influences. To sort out this problem, it is pertinent that the time series properties of the data set employed in estimation of the equations is ascertained. Therefore, the Augmented Dickey Fuller (ADF) unit root is performed in order to test the stationary of the variables. The Unit Root Test is a series statistics. Dickey and Fuller (1979) opines that if a series is stationary after differencing it *k* times, is said to be integrated of order *k*, that is, X_t [] $I(k)$. If the results show that the t-ratio calculated is less than the critical t-value (table value), the null hypothesis of unit root (non stationary) is not accepted in which case the level of time series X_t is characterized as integrated of order zero i.e. I (0). Conversely, if it is observed that the individual time series in the equation are integrated of order one I(1), then the series is said to be non stationary. The Johansen (1991) co integration test procedures is employ when to test the co -integration among the variables the variables are integrated of the same order I(1). Otherwise if the variables are integrated of mixed order, the ARDL becomes applicable. The ADF test is based on the following equation:

$$X_t = {}_o + {}_1 t + {}_{t-1} + \sum_{j=1}^{m} \mathbf{Y_j} X_{t-j} + {}_1 \quad \ldots \quad (2)$$

where

X_t is integrating series (independent variable), is coefficient, $_{Yj}$ is integrating series (dependent variable), is the first difference operator; t is the time trend; $_o$ is a drift; $_t$ represents the linear time trend; *m* is the lag length; $_1$ is a white noise process.

Correlation test

We employed the correlation analysis to enable establish if there is relationship existing between the explanatory and dependent variables. Such relation can be strong weak, positive or negative.

Autoregressive distributed lag test (ARDL)

Cromwell et al (1994) opine that ARDL is a time series data model for prediction of a regression equation for the current values of an observed variable based on both the current values of the independent variable and the lagged (past periods) values of the explanatory variable.

The starting point of for a distributive lag model is an assumed structure of the form.

$$Y_t = \alpha + W_0 \chi_t + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + W_n \chi_{t-n} + \in \quad \ldots (3)$$

Alternatively , the distributive lag model is

$$Y_t = \alpha + W_0 \chi_1 + W_1 \chi_{t-1} + W_2 \chi_{t-2} + \ldots + \in \quad \ldots (4)$$

where, Y_t is the value at the time period t of the dependent variable y, α = the intercept term to be estimated, W_0 is the explanatory powers of the variables, χ_t = explanatory variable, W_1,W_2 are the lag weight, $\in$ = the error term

In the first equation, the regressed variable is affected by values of the explanatory variables arbitrarily in the past, so the number of lag model weights is infinite and therefore the model is called the infinite distribution model. On the other hand, in the second and alternative equation there are

only a finite number of lag weights, indicating an assumption that there is a maximum lag beyond which values of the independent variables do not affect the dependent variable. A model based on this assumption is described as a finite distribution lag model.

The long run relationship of the underlying variable is dictated through the F-statistic (Wald test). Long run relationship of the series is said to be established when F-statistic is more than the value in the critical value band. The major advantage of this approach lies in the identification of the co-integrating vector. However this technique will not be applicable when there is the presence of the integrated stochastic trend I(2). To be on a safe side and forestall efforts in futility, it is recommended that unit root tests be conducted, although this in not a necessary condition.

Pair-wise Granger Causality Test

In the case where there is co-integration among the variables, we go a step further to construct the standard Granger causality test. In order to perform the test for Granger causality, we estimate the equations in the following form:

$$\Delta LPINV = \sum_{i=1}^{m-1} \beta \ \Delta LPCI_{t-1} + \sum_{i=1}^{m-1} \delta_j \Delta LPINV_{t-j} + \varepsilon_t \quad \ldots(5)$$

$$\Delta LPINV = \sum_{i=1}^{m-1} \beta \Delta LPCI_{t-1} + \sum_{i=1}^{m-1} \lambda_j \Delta LPINV_{t-j} + \mu_1 \quad \ldots(6)$$

where

$LPCI_t$ is the log of per capita income; $LPINV$ is the log of public investment i.e. GEXP, Inf, GFCF, LR and EXR; μ_1 is the white noise disturbance term, ε is also the white noise disturbance term

There is no causal relationship (or that one variable does not Granger cause the other) between the variables if the probability value equals to, or greater than 0.05 and we accept the null hypothesis. If the p-value (the probability)

is less than 0.05, we reject the null hypothesis that there is no causality existing between the variables and so we refuse to reject the alternative hypothesis that one variable Granger cause the other. Thus if probability = or > 0.05 , accept (do not reject) the null hypothesis, if probability < 0.05, reject (do not accept) the null hypothesis.

4. RESULTS AND FINDINGS

Results

Descriptive Statistics

Table 1

	PCI	EXR	GEXP	GFCF	INF	LR
Mean	1124.332	90.65210	1479053.	1766851.	17.96357	19.90208
Median	512.7000	21.88610	136731.0	114476.3	13.40000	20.86000
Maximum	3526.000	566.0000	8003451.	10571740	72.80000	36.09000
Minimum	153.6000	0.546400	0.904000	5417.000	3.200000	6.000000
Std. Dev.	1107.014	117.2895	2255638.	3363877.	14.50626	7.712822
Skewness	0.902108	1.699950	1.577218	1.861473	2.013167	-0.060433
Kurtosis	2.153898	6.504082	4.414568	4.696593	6.749276	1.924817
Jarque-Bera	8.769472	52.64205	26.39284	36.96476	66.84279	2.585135
Probability	0.012466	0.000000	0.000002	0.000000	0.000000	0.274565
Sum	59589.60	4804.561	78389817	93643090	952.0690	1054.810
Sum Sq. Dev.	63725008	715355.1	2.65E+14	5.88E+14	10942.44	3093.356
Observations	53	53	53	53	53	53

Source – Researcher's Computation

The estimated mean value is employed for the dispersal pattern estimation. The figures are 1124 for personal income and 90.65, 147905, 17668, 17.96 and 19.9 for exchange rate, government expenditure, gross fixed capital formation, inflation and lending rate respectively. The standard deviation depicts the variability from the mean or average value. The values shown in the Table 1 above depicts that for PCI it stood at 1107 while for the explanatory variables it is 117, 2255638, 3363877, 14.5 and 7.7 respectively. It depicts that some variables have low variability such as lending rate and inflation while others have high variability. In summary, all values are widely

dispersed around the mean. This indicates that they are grossly affected by the extreme mean.

Except the value for lending rate with value of -0.06, the values of the other variables are positively skewed with such values as 0.9 for the private income, 1.6, 1.5, 1.86 and 2.01 respectively for the independent variables.
For kurtosis can be flat or peak in terms of the normal curve. As it is well known, kurtosis measures the "tailedness" of the probability distribution of a real valued random variable. The decision rule is as follows- if kurtosis is equal to 3, it is concluded that it is normal distribution or mesokurtic; if kurtosis is less than 3 it is platykurtic; if kurtosis is greater than 3, it is leptokurtic.

Also the variables depict reasonable level of association with probability significant at 0.05 level of significance.

Jarque-Bera is used to measure the normality of the series, that is to say whether the series are normally distributed or not. The decision rule is that at 5% level of insignificance, the residuals are normally distributed.

Although the variables exhibit reasonable sign of association in the descriptive analysis, we also subject these claims to more econometric test to confirm these claims.

Econometric Tests Results

Table 2 Unit Root test result

Variable	Intercept Only	Decision	Trend and Intersect	Decision
LPCI	-2.9237	I(0)	-3.5543	I(0)
	(6.9759)*		(-6.9473)*	
LEXR	-2.9251	I(1)	-3.6545	I(1)
	(-0.2758)		(-1.6583)*	
LGEXP	-2.9251	I(1)	-3.6485	I(1)
	(1.9244)		(-0.3764)*	
LGFCF	-2.9543	I(1)	-3.5546	I(1)
	(-1.5532)		(-2.654)	
LINF	-2.9453	I(1)	-3. 5043	I(1)

	(7.3517)		(2.0543)*	
LLR	-2.9543	I(0)	-3.5543	I(0)
	(-5.8432)		(-6.1643)*	

* (**) *** Significant at 0.01, 0.05 and 0.10 level of significance

Source – Researcher's Computation

In the table above the series are of mixed integration, the autoregressive distributed lag method is then adopted. In the above table, the series clearly show that the series are integration are in mixed order, some in I(0) while some are in I(1). Therefore the ARDL method becomes appropriate.

Table 3 **Correlation Test Results**

	PCI	EXR	GEXP	GFCF	INF	LR
PCI	1					
EXR	0.8468	1				
GEXP	0.9189	0.9359	1			
GFCF	0.7008	0.4682	0.5029	1		
INF	-0.2971	-0.2236	-0.2174	-0.2148	1	
LR	0.4972	0.6420	0.5967	0.3695	0.1351	1

Source: Researchers' computation

The correlation analysis is used in order to enable establish if a relationship exists between public investment and private income. The correlation result is depicted in Table 3. From the results, the rate of exchange, government expenditure and gross fixed capital formation exhibits very strong positive relationship with public investment with 84%, 91% and 70% explanatory relationship respectively. It implies that the variables move together, hence as the rate of exchange, government expenditure and gross fixed capital formation increases, private income also improves. However and expectedly, inflation rate has a negative sign implying that it has an inverse relationship with private income. Hence as inflation increases the real private income decreases. The lending rate has weak positive relationship with income level of individuals.

Table 4 ARDL Results

Dependent variable PCI

Method- ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
PCI(-1)	1.166424	0.120019	9.718669	0.0000
PCI(-2)	-0.448193	0.157051	-2.853802	0.0070
EXR	0.819150	0.648094	1.263938	0.2142
GEXP	0.000348	0.000104	3.346839	0.0019
GEXP(-1)	-0.000401	0.000146	-2.755171	0.0090
GEXP(-2)	0.000370	0.000151	2.444502	0.0194
GEXP(-3)	0.000207	0.000173	1.194446	0.2399
GEXP(-4)	-0.000560	0.000164	-3.420748	0.0015
GFCF	4.19E-05	1.52E-05	2.760694	0.0089
INF	-0.171428	1.706918	-0.100432	0.9205
LR	-7.822194	4.310089	-1.814857	0.0777
C	230.1381	105.7825	2.175578	0.0360

R-squared	0.985955	Mean dependent var	1198.851
Adjusted R-squared	0.981779	S.D. dependent var	1119.107
S.E. of regression	151.0614	Akaike info criterion	13.08214
Sum squared resid	844323.7	Schwarz criterion	13.54545
Log likelihood	-308.5125	Hannan-Quinn criter.	13.25792
F-statistic	236.1248	Durbin-Watson stat	2.303961
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Source: Researchers' Computation

The R-squared value 0.98 and adjusted R squared of 0.98 shows that only 98 per of personal income of an average individual is accounted for by government investment. This confirms significance of the explanatory variable to drive the dependent variable.

The coefficient of the explanatory variable exchange rate having insignificant positive value of 0.81 has insignificant effect on PCI having a probability of 0.21. This implies that the rate of exchange have a weak positive insignificance on personal income. With regards to government expenditure which has a coefficient value of 0.0003 which depicts very weak positive effect; however it is significant having a probability of 0.001 which is lesser

than 5% level of significance. This means that government expenditure has a weak positive significant effect on driving personal income. For the gross fixed capital formation which has a negative coefficient, and probability of 0.008 show negative significant effect on personal income. For inflation with coefficient of -0.17 and a probability of 0.92 depicts negative insignificant relationship on personal income. For lending rate, it has a coefficient of -7.8 and a probability of 0.07 depicts negative insignificant relationship on personal income.

Furthermore we test for the existence of a long run relationship between the dependent variable and the explanatory variables. This is done by using the Wald test that all the coefficients of the variations in levels are equal to zero. We draw a comparison between the estimated F-statistics with bounds and the F-critical or tabulated value. The 50%, 95%, 99% bounds critical F- value test bands for k=6 are (2.960-3.79), (3.12-4.25), (3.93-5.23) for model with both constant and trend. The calculated F-statistic is 236.1. This is greater than the bounds F- critical test. This indicates existence of a long-run relationship between the dependent variables and explanatory variables.
The error correction model value of 230 and a probability of 0.03 imply that the speed of adjustment towards equilibrium between the short and long run is adjusted by speedily by 230 per cent. That is to say that the speed of adjustment towards long run equilibrium is very fast at 230 percent annually in the case of occurrence of any shock.

For the short run relationship, for there to be a long run relationship among the variables, the coefficients of the variables must be negative and also be significant at 5% level of significance . using the one –lag period, the results depicts that only government expenditure is significant at 5% level.

From the above, we conclude the existence of long run relationship between the explanatory variables and the dependent variable.

Table 5. Pairwise Granger Causality Result

Null Hypothesis	F- statistic	Probability	Decision	Type of causality
LEXR ≠ >LPCI	6.4672	0.0033	Rejected	Causality
LPCI ≠ *>LEXR*	1.5236	0.2287	Not Rejected	No Causality
LGEXP ≠ *>LPCI*	4.0647	0.0237	Rejected	Causality
LPCI ≠ >LGEXP	0.3504	0.7062	Not Rejected	No Causality
LINF ≠ *> LPCI*	0.0229	0.9773	Not Rejected	No Causality
LPCI ≠ >LINF	1.0572	0.3557	Not Rejected	No Causality
LGFCF ≠ >LPCI	0.1161	0.8906	Not Rejected	No Causality
LPCI ≠ *>LGFCF*	4.1592	0.0219	Rejected	Causality
LLR ≠ *>LPCI*	0.6148	0.5451	Not Rejected	No Causality
LPCI ≠ *>LLR*	1.1471	0.3265	Not Rejected	No Causality

Source: Researchers' computation

We go further to perform the Pair-wise Granger Causality test. It is a group and descriptive statistics. Table 5 depicts the results. The results as depicted in the table show an interesting finding. The probability of causality between exchange rate and stock prices is 0.003 depicting causality and that of personal income to exchange rate is 0.22 depicting no causality as it is greater than 0.05. Therefore there is a unidirectional causality between exchange rate and PCI running from exchange rate to PCI.

In the same vein, the probability of causality between the government expenditure and PCI is 0.02 and that of PCI to government expenditure is 0.70 depicting no causality. So there is a unidirectional causality between government expenditure and PCI running from government expenditure to PCI.

Also the probability of causality between inflationary trends and PCI is 0.97 and that of PCI to inflation is 0.35. Both probabilities are greater than 0.05 and therefore suggest no causality. We conclude that there is no causality between inflation and PCI.

Finally, the probability of causality between gross fixed capital formation and per capita income 0.89 showing no causality and that of PCI to gross fixed capital formation is 0.02 depicting causality. Both probabilities are greater than 0.05 and therefore suggest no causality. There is unidirectional causality between gross fixed capital formation and per capita income running from gross fixed capital formation to PCI.

The probabilities of causality from lending rate to PCI and from PCI to lending rate are 0.54 and 0.32 respectively. Both probabilities are greater than 0.05 and therefore suggest no causality between lending rate and PCI.

From the above the following findings are discernable
There is the existence of long run relationship between the explanatory variables and the dependent variable.

Therefore there is a unidirectional causality between exchange rate and PCI running from exchange rate to PCI.

There is a unidirectional causality between government expenditure and PCI running from government expenditure to PCI.

There is no causality between inflation and PCI.

There is unidirectional causality between gross fixed capital formation and per capita income running from gross fixed capital formation to PCI.
No causality between lending rate and PCI.

Discussion of Findings
There is the existence of a long-run relationship between the dependent variables and explanatory variables.

The rate of exchange has a weak positive insignificance on personal income. There is a unidirectional causality between exchange rate and PCI running from exchange rate to PCI. Exchange rate triggered personal income in a weak positive but insignificant level. This is due to the fact that the domestic

currency is both weak and depreciating. This has further reduced personal income to a very low level. That is to say that when the income is translated in terms of foreign and strong currencies, the value of the domestic currency becomes next to nothing. This is in agreement to the findings of Duruechi and Ojiegbe (2015).

Government expenditure has a weak positive significant effect on driving personal income. There is a unidirectional causality between government expenditure and PCI running from government expenditure to PCI. This implies that government expenditure should drive personal income. However this cannot be achieved in isolation, rather other macro factors such as inflation, lending rate and others are inimical to achieving this. This corroborates with the findings of Ogu and Ojimadu (2019)

The gross fixed capital formation which has a negative coefficient, and probability of 0.008 show negative significant effect on personal income. There is unidirectional causality between gross fixed capital formation and per capita income running from gross fixed capital formation to PCI.

Inflation depicts negative insignificant relationship on personal income. There is no causality between inflation and PCI. While inflation rate is desirable in the economy, yet when it is soaring and sustained, it becomes inimical to both the economy and the individual in particular. Inflation depicts the real and actual value of the income and investment over time. This finding is in tandem with that of David et al (2020).

Lending rate, it has a coefficient of -7.8 and a probability of 0.07 depicts negative insignificant relationship on personal income. Therefore, suggest no causality between lending rate and PCI. High lending rate is although may be good for the economy, may also lead to discouragement in investment. This will deter capital accumulation.

5. CONCLUSION, SUMMARY AND RECOMMENDATION

This study is concerned to investigate the effect of public expenditure on personal income in Nigeria from 1970 to 2022. The monsters of poverty, hunger, unemployment, poor standards of living among others are prevalent in our society today despite huge government investments. The descriptive and econometric statistics were adopted for data analysis. Results depict a long run relationship between the public investment and personal income. We found the existence of long run relationship between the dependent and explanatory variables.

Policy Implication of Findings

Certain factors such as inflation rate, exchange rate, lending rate and low capital formation have been inimical to private investment as they have adversely affected efforts towards public investment hence the continued persistence of poverty, hardship, unemployment, low living standards in the country. By extension personal income could have been further boosted if proper public investment policies have been implemented. It is thus extended to mean that the inflation, exchange rate and capital formation policies so far implemented are not personal income -friendly. The reasons adjudged to this may be due high inflation, exchange rate unpredictability, igh lending rate among others.

Recommendations

(i) The soaring inflationary trend, weak and unstable exchange rate of the domestic currency should be checked and monitored to desirable single-digit rate that will not adversely affect personal income.

(ii) The lending rate which is a determinant factor of investment should be monitored to restore confidence on the local and foreign investors. This will no doubt enhance and engender more investment and further boost favorable capital accumulation that will trigger more investment returns. This will no doubt boost personal income.

(iii) The rate of exchange should be more predictable.

REFERENCES

Central Bank of Nigeria CBN Statistical Bulletin – various issues.

Cromwell , J. B. (1994). Multivariate tests for time series models. *SAGE publications* ISBN 0-8039-5440-9

David, J., Sankako, M. A. and Obilikwu, J. (2020). The determinants of domestic investment in Nigeria: a new evidence from non-linear autoregressive distributed lag (NARDL) model. *Economics and Management*, XVII (2): 1-25

Dickey , O. A., and Fuller, D. (1981) "The Likelihood Ratio Statistics for Autoregressive Time Series with a Unit Root" Econometrica 251-276.

Duruechi A. H. and Ojiegbe, J.N., (2015). Determinants of Investments in the Nigerian Economy

(1990-2013). *International journal of Financial Research, 6(4)*

Engle R. F. and Granger, C W J. (1987) Co integration and Error Correction: Representation, Estimation and Testing. *Econometrica,* 55,(2) 51-76

Mackinnon, J.G., (1991) "Critical Values of Co integrating Tests", Long run Economic relationships: In, Engle R. F. and Granger, C W J. co integration Advanced Texts in Econometrics by Oxford University Press

Nguyen , C and Trinh, l., 2018, The impacts of public investment on private investment and economic growth: evidence from Vietnam. Journal of Asian Business and Economic studies vol 25,no 1, 15-32

Ogu, C. and Ojimadu,P., (2019). Macroeconomic performance in Nigeria. *International Journal of Social Sciences and Humanities Reviews, 9(1):341-351*

Okereke, L.C., (2015) Managerial Accounting and control: A professional Appraoch. *The Accountant,* 12(4), 31-43

Pesaran, M. H.and Shin, Y., (1995) "An Auto regression Distributed Lag Modeling Approach to Co integration Analysis". Cambridge working Paper in Economics, 9514, RiPEc:cam:camgae:9514

Pesaran, M. H., Shin, Yongcheal, and Smith, R.J. (2001) "Bounds Testing Approach to the Analysis of Level Relationships" *Journal of Applied Econometrika, 16* (3) 12-38. https://www.jstor.org/stable//2678547

The Organization for Economic Cooperation and Development (OECD) (2020)

United Nations Conference on Trade and Development UNTAD (2015). Trade and Development
Report TDR , Geneva

Perceptions of Cryptocurrency among Undergraduate Students of Olabisi Onabanjo University

****

Abdul-Azeez Adeniyi Alao[1] & Oluwasegun Temitayo Odunsi[2]

Abstract

Despite the rising acceptance of cryptocurrency in Nigeria and the need for alternative legit investment substitutes among young people in Nigeria, there remains a notable gap in research regarding the perceptions and attitudes of Nigerian students towards this digital asset class. This study, therefore, investigated the perceptions of cryptocurrency among undergraduate students of Olabisi Onabanjo University. The study employed survey approach to collect data. A total of two hundred and forty-nine (249) responses from the Google form questionnaire was used for the analysis. The validity and reliability (Cronbach Alpha = 0.742) of the research instrument were established. The data were later analysed using the Analysis of Variance (ANOVA) test at 5 percent "level of significance". The results revealed that there is no significant difference in the perceptions of the students across different faculties and levels. The study concluded that majority of the students have embraced cryptocurrency applications/products. Therefore, it is recommended that there is the need for the "National Universities Commission (NUC) " to complement the curriculum of each of the courses in the newly introduced "Core Curriculum and Minimum Academic Standards for the Nigerian University System (CCMAS)" with elements of electronic banking as well as the need for the Nigerian

[1-2] *Department of Accounting, Olabisi Onabanjo University, Ago-Iwoye, Nigeria*

government to introduce a legislation that governs cryptocurrency activities in the country.

Keywords: Cryptocurrency, Nigerian universities, Nigerian students, ANOVA, UTAUT

JEL Classification: G23, M15, M48

1.0 Introduction

Cryptocurrency business in Nigeria has grown significantly in the last few years due to a number of factors that have increased technology acceptance and demand. The rising use of Smartphones is one of the main factors contributing to this expansion. This is because people can readily access cryptocurrency exchanges and wallets through their mobile devices, and there has been a corresponding growth in cryptocurrency usage and trading activity as more Nigerians get access to Smartphones and the internet (Olugbenga, 2018). According to Agama and Akanegbu (2022), Nigeria is one of the countries with higher users and adopters of cryptocurrency. This was as a result of the search for different investment prospects among Nigerian. Besides, in terms of legislation and/tax revenue buoyancy, section 2 of the Finance Act (2023) included digital assets (cryptocurrency and tokenised assets) as chargeable assets for Capital Gains Tax (CGT) computation. Therefore, any chargeable gains derived from the disposal of such assets are henceforth chargeable to CGT at 10%.

Furthermore, there are a lot of young people in Nigeria who are looking for alternative investing substitutes. Many Nigerians, especially the younger generation, have resorted to cryptocurrencies as a way of investment and financial empowerment due to the lack of traditional investment possibilities and a desire to investigate new paths for wealth development. They can now engage in the international financial markets with the possibility of large returns and portfolio diversification. Besides, scholars have come up with three (3) factors that accounted for

the increase in the demand/use of crypto/virtual currency. Sauer (2016) identified two factors – an avenue for protesting against the traditional monetary decisions and also an option for overcoming/coping with several disparities in the monetary systems while Agama and Akanegbu (2022) identified the fact that cryptocurrency is a freedom money with no specific regulations.

Additionally, the adoption of cryptocurrencies as a method of accessing financial services has been fueled by the need for financial inclusion in Nigeria, where a sizable section of the population is still unbanked or underbanked. With the help of cryptocurrencies, people may keep and transfer money without depending on traditional banks, giving them more control over their financials. Many Nigerians, especially those who have limited access to traditional banking services or have difficulties with the current financial infrastructure, have found great resonance with this aspect of financial independence (Olugbenga, 2018).

Nigerian students, in particular, have become important figures in the demand/use of crypto/virtual currency (Famuyide & Adeyemi, 2020). Their position as early adopters of technology and engaged members of online communities is crucial in influencing trends and promoting innovation within the cryptocurrency industry. In order to take the advantage of new chances in the developing cryptocurrency ecosystem, a large number of students are actively engaged in cryptocurrency trading, mining, and blockchain initiatives. They do this by using their digital skills and entrepreneurial spirit. Their zeal and involvement add to the liveliness and energy of Nigeria's bitcoin sector. However, the cryptocurrency market in Nigeria continues to experience rapid growth, fueled by factors such as increasing smartphone penetration, a youthful population eager for investment opportunities, and the need for financial inclusion. Nigerian students, with their tech-savvy nature and entrepreneurial mindset, are at the forefront of this transformation, driving innovation and shaping the future of finance in the country.

Despite the growing popularity of cryptocurrency in Nigeria, there remains a notable gap in research regarding the perceptions and attitudes of Nigerian students towards this digital asset class. Therefore, understanding these perceptions is crucial for policymakers, educators, and industry stakeholders to formulate effective strategies for regulating, educating, and leveraging cryptocurrency in Nigeria's evolving financial landscape. By gaining insights into Nigerian students' views on cryptocurrency, stakeholders can develop targeted interventions to promote financial literacy, consumer protection, and responsible investment practices, thereby harnessing the potential benefits of cryptocurrency while mitigating associated risks. It is against this background that the present study investigated the perceptions of Nigerian students on the use/adoption of cryptocurrency products.

1.1 Aim and Objectives of the Study

The aim of this study is to provide evidence on the perceptions of the undergraduate students Olabisi Onabanjo University on cryptocurrency. The specific objectives of the study are to:

(i) investigate the perceptions of the students across faculties on cryptocurrency, and
(ii) examine the perceptions of the students across levels on cryptocurrency.

1.2 Research Questions

The study is planned to provide answers to the following research questions;

(i) to what extent do perceptions of the students across faculties on cryptocurrency differ? and
(ii) what is the difference in the perceptions of the students across levels on cryptocurrency?

1.3 Hypotheses Development

The following null hypotheses were formulated to provide answers to the study's research questions:

Ho_1: There is no significant difference in the perceptions of the undergraduate students of Olabisi Onabanjo University across faculties on cryptocurrency.

Ho2: There is no significant difference in the perceptions of the undergraduate students of Olabisi Onabanjo University across levels on cryptocurrency.

2.0 Literature Review

2.1 Conceptual Review

2.1.1 Cryptocurrency

Okpalaojiego (2021) conceptualised cryptocurrency as a digital form of currency designed to function as a medium of exchange, lacking a tangible presence and only transferrable electronically. According to Grew (2023), cryptocurrencies or virtual currencies are digital mediums of exchange originated and utilized by private individuals or groups. In essence, cryptocurrency is a virtual currency rooted in a decentralized ledger and safeguarded by cryptographic measures. Currencies such as Bitcoin negate the necessity for banks and other financial intermediaries to oversee the transaction of currencies and assets. Many cryptocurrencies are classified as alternative currencies since they operate without regulation from national governments and function independently of state monetary policies (Okpalaojiego, 2021). The global economy stands to gain significant advantages from cryptocurrencies, as they have the potential to facilitate widespread social and economic development, particularly in developing nations, by providing more accessible avenues to capital and financial services (Osagwu & Okafor, 2022).

Digital currencies represent a recent and innovative development in the evolution of modern financial systems. These currencies serve as electronic substitutes for traditional fiat (paper) currencies, enabling transactions without geographical limitations and existing solely in digital form. Halaburda et al. (2020) classified digital currencies into two main categories: privately issued DCs and Central Bank-issued DCs (CBDCs). The inaugural private digital currency, Bitcoin, was

introduced by Nakamoto in 2008 and became operational in 2009. Subsequently, numerous other digital currencies have surfaced, gaining increasing acceptance on both local and global scales. The widespread acceptance and growth of cryptocurrencies can be attributed to the success stories of individuals who achieved substantial profits over both short and extended periods of their investments (Adamu et al. 2021). The decentralized nature of cryptocurrencies, allowing participation in trading from any country without exclusion, underscores their success. This inclusive approach has been observed to impact the quality of life at the individual level and enhance efficiency at the corporate level (Ebizie et al. 2022). Governments and central banks globally are actively monitoring the progress of digital currencies and addressing associated challenges (Osagwu & Okafor, 2022).

Virtual currencies arise from the concept of lacking physical form, promoting convenience and anonymity in financial transactions. They share similarities with digital currencies due to their unregulated nature and are occasionally used interchangeably, as noted by Nwosu (2021). However, the European Central Bank (ECB) has modified this perspective, acknowledging some level of regulation for these payment instruments in certain jurisdictions. Consequently, they are now defined as a "digital representation of value, not issued by a central bank, credit institution, or e-money institution" (ECB, 2015). Platt et al. (2023) highlight that U.S. regulators categorize virtual currencies based on three dimensions: centralized convertible virtual currencies (with a central repository), decentralized convertible virtual currencies (lacking a central repository and e-currency brokers), and e-currencies. The main subject of this study is cryptocurrencies, categorized as decentralized convertible virtual currencies. These digital assets are both issued and traded without the support of any monetary authority, as indicated by Platt et al. (2023). The rise of virtual currencies has been facilitated by the inherent instability of domestic currencies and a decreasing level of trust among the banking public, as noted by Adamu et al. (2021).

Cryptocurrency investment trading operates globally and spans various secondary markets distinct from traditional stock markets (Grew, 2023). In contrast to traditional stock trading, which relies on fundamental factors such as corporate financials and future projections, cryptocurrency trading is influenced by metrics that are inherently less objectively quantifiable (Nwosu, 2021). These metrics encompass a range of factors, including social media news, social perceptions, convenience preferences, perceived usefulness, the extent of financial literacy, and performance expectancy. The decision-making process for cryptocurrency investments is predominantly shaped by users' levels of financial risk tolerance, prevailing societal norms, attitudes, and perceived benefits derived from the investment (Nwosu, 2021). Typically, cryptocurrency investors are characterized as young and technologically savvy individuals, with assessments often focused on correlation coefficients associated with cryptocurrency indices.

2.2 Theoretical Review

The theories relating to cryptocurrency highlighted in this work include the following: Social Influence Theory, Unified Theory of Acceptance and Use of Technology (UTAUT), Theory of Planned Behavior (TPB), and Risk Perception Theory.

2.2.1 Social Influence Theory (SIT)

SIT encompasses various concepts and principles from multiple researchers and psychologists over time. Key contributors to this theory include Muzafer Sherif, Solomon Asch, Leon Festinger, and Stanley Milgram. SIT explains how individuals' attitudes, beliefs, and behaviors are influenced by others and this can be directly applied to understanding the dynamics of cryptocurrency adoption and market trends. Individuals often make investment decisions based on the actions and opinions of their peers. If a person sees their friends or influential figures (e.g., celebrities or financial experts) investing in a particular cryptocurrency, they might feel compelled to follow suit, even if they don’t fully understand the market or the technology.

Opinion leaders, such as industry experts, influencers, and celebrities, have a substantial impact on the cryptocurrency market. Their endorsements or criticisms can sway public opinion and investor behavior. For instance, tweets by influential figures like Elon Musk have been known to cause significant fluctuations in the value of cryptocurrencies such as Bitcoin and Dogecoin. People often conform to the expectations of a social group to be accepted and avoid rejection. In the cryptocurrency space, this might mean investing in popular coins or adopting certain trading behaviors because they are seen as the norm within a community. This perspective highlights the importance of psychological and social factors in financial markets, particularly in emerging and highly speculative areas like cryptocurrency.

2.2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

The theory was introduced by Venkatesh et al. (2012). It is a model developed to understand and predict the acceptance and usage of technology by individuals or groups within a society. More so, it was introduced to integrate various preceding technological models. The UTAUT model demonstrated superior performance compared to all other individual technology adoption models during testing and comparison. Subsequently, the model underwent evaluation against various data sources, consistently emerging as the most successful. Consequently, the UTAUT model presents a valuable instrument for assessing the likelihood of success in adopting new technologies. Moreover, it provides valuable insights into the influencing factors for acceptance, empowering proactive interventions for user groups with potential resistance to innovation.

2.2.3 Theory of Planned Behavior (TPB)

TPB is a psychological theory that seeks to explain human behavior in specific contexts. It was proposed by Ajzen (1985) as an extension of the earlier Theory of Reasoned Action. TPB posits that an individual's intention to engage in a behavior is the most significant predictor of whether they will actually do so. According to TPB, for a behavior to be

performed, an individual must have a positive attitude towards the behavior, perceive social approval or support for the behavior, and believe they have the control or ability to perform it. In practical terms, TPB is often used to design interventions aimed at changing behavior by targeting these three determinants: changing attitudes, altering perceived social norms, and enhancing perceived behavioral control. Also, TPB posited that the stronger the positive attitude, subjective norms, and perceived behavioral control towards cryptocurrencies, the stronger the individual's intention to use cryptocurrencies. The intention to use cryptocurrencies is likely to result in actual behavior (e.g., purchasing or trading cryptocurrencies) if the individual perceives high control over the behavior.

2.2.4 Risk Perception Theory

Risk Perception Theory has been significantly developed through the contributions of several key researchers, most notably Paul Slovic, Baruch Fischhoff, and Sarah Lichtenstein. These scholars are often credited with foundational work in understanding how people perceive and respond to risks. Risk Perception Theory explores how individuals and groups perceive and respond to risks, often influenced by psychological, social, cultural, and individual factors. In the context of cryptocurrency, Risk Perception Theory can help explain the varying attitudes and behaviors people have towards investing in and using digital currencies.

Individuals' personal experiences, cognitive biases, and emotions play a significant role in how they perceive the risks associated with cryptocurrency. The influence of peers, family, and social networks can shape one's perception of cryptocurrency risks. If someone sees their social circle investing in or discussing cryptocurrencies positively, they might perceive the risks as lower and feel more inclined to invest. Trust in the underlying technology of cryptocurrencies, such as blockchain, and the entities that operate within the cryptocurrency space (exchanges, wallets, etc.) also plays a role in risk perception. Higher trust can lead to a lower perception of risk and vice versa. Understanding these factors

through the lens of Risk Perception Theory helps explain why some people are enthusiastic about cryptocurrencies despite their volatility and regulatory uncertainties, while others remain skeptical and avoid them altogether.

The theory that underpinned this research work is the "Social Influence Theory". This is because the propositions of the theory as earlier discussed align with the objectives and findings of this study.

2.3 Empirical Review

Bala et al. (2021) conducted a study to examine the extent of awareness and acceptance of cryptocurrencies among students enrolled in tertiary institutions located in Sabon Gari and Zaria Local Government Areas of Kaduna State. The researchers gathered primary data through an online structured questionnaire administered to two hundred and forty-two (242) students randomly selected from the aforementioned local government areas. The data were then subjected to descriptive statistical analysis. The results revealed a notable level of awareness regarding cryptocurrencies among students attending Universities, Polytechnics, and Colleges of Education. Specifically, 98 percent of respondents indicated awareness of bitcoins, the most prevalent cryptocurrency in the study area. Despite this high awareness, the study found relatively low levels of adoption among the overall sample. Consequently, the researchers concluded that while a significant number of young individuals in Kaduna State are aware of cryptocurrencies, only a small percentage have embraced or are actively involved in trading these digital assets.

Okpalaojiego (2021) investigated the perspectives of Nigerians and cryptocurrency traders regarding the effects and implications of the cryptocurrency ban on the Nigerian economy. Employing a Survey research design, the researcher utilized a random sample technique, consisting of four hundred (400) participants selected from a population of four thousand (4000). This population included crypto traders, bankers, bank customers, university staff, students, and the general

public. Data collection was accomplished through structured questionnaires, and the analysis employed mean score averages. The findings revealed, among other things, that the abrupt prohibition of cryptocurrency trading and transactions had significantly disrupted the crypto market in Nigeria. Additionally, it inflicted emotional shock and trauma on crypto traders, hindering them from purchasing cryptocurrencies using credit or debit cards issued by Nigerian banks. The implications of these findings suggested, among other things, that the ban may pose challenges for individuals aiming to possess cryptocurrencies due to restrictions on buying or selling. Furthermore, it could contribute to the persistent depreciation of the Naira's value, resulting in financial losses for Nigerians. Ultimately, this may lead to severe unemployment, impoverishment, and hunger among the unemployed youths who rely on cryptocurrency trading for their livelihoods.

Nwosu (2021) conducted a study that delved into the considerable influence of cryptocurrency adoption on the financial inclusion of young individuals in Nigeria. The research specifically focused on residents of Lagos State, with one hundred and fifty-seven (157) respondents selected through convenience sampling. The collected data underwent analysis utilizing WPS Sheets and STATA software, and the empirical findings were visually represented through tables and charts. Descriptive statistics were employed for quantitative analysis, and the chi-square test was applied to ascertain the impact of cryptocurrency adoption on the financial inclusion of the youth in Nigeria. The results of the study revealed that cryptocurrencies indeed exerted a significant influence on enhancing financial inclusion among Nigerian youths.

Agama and Akanegbu (2022) investigated the influence of crypto currencies on macroeconomic variables in Nigeria. The authors employed the monthly data set of five (5) macroeconomic indices – money supply, exchange, inflation and interest rates as well as stock market performance while the price of Bitcoin was used to measure cryptocurrency. The study covered a period from July 2010 to May 2021

while the Vector Autoregression Model and Quantile Regression technique were employed to analyse the nexus among the variables. Results from the study showed a positive nexus between the price of Bitcoin and money supply, exchange, inflation and interest rates. The study, therefore, recommended the need for regulatory pronouncements to compress the predicted influence of crypto currencies on macroeconomic variables.

Ebizie et al. (2022) conducted a study on cryptocurrency adoption among FinTech entrepreneurs in Nigerian universities, employing the Unified Theory of Acceptance and Use of Technology (UTAUT) paradigm. The research focused on three prominent universities in Anambra state. A total of three hundred and twenty-three (323) students were sampled, with three hundred and thirteen (313) accurately completed and returned questionnaires forming the basis for analysis. The results indicated a positive correlation between performance expectancy, effort expectancy, facilitating conditions, and cryptocurrency adoption. However, no significant relationship was identified with social influence.

In the 2022 research conducted by Osagwu and Okafor, the focus was on understanding the impact of advertising on the purchase intentions of cryptocurrency among young adults in Awka, Nigeria. The researchers collected data through a questionnaire from a randomly selected sample of one hundred and thirty-eight (138) individuals. Analysis and interpretation of the data were carried out using regression models and descriptive statistics. The study delved into the influence of advertising by scrutinizing variables such as awareness, interest, desire, and action, and their effects on consumers' intentions to purchase cryptocurrency. The results indicated that the majority of these advertising-related variables exerted a significant influence on purchase intentions.

Platt et al. (2023) adopted a consumer-centric approach to examine the sentiments of Nigerian cryptocurrency users (N = 158) regarding their views on the sustainability of Bitcoin, a representative cryptocurrency

known for its high electricity consumption. The study revealed three key findings – despite claiming high knowledge levels, the majority of participants significantly underestimated Bitcoin's energy demand; individuals accurately gauging Bitcoin's energy demand were more inclined to support measures addressing this issue compared to those with inaccurate estimations, and supporters of such measures predominantly attributed responsibility to private actors. The study concluded that enhancing consumer education may be a crucial task for policymakers in the realm of cryptocurrency sustainability.

Poongodi and Anandraj (2023) investigated the awareness and factors determining the investments in cryptocurrency among the general public in selected cities of Tamilnadu, India. Being a descriptive research, questionnaire was administered among the respondents via the Google form while the analysis was conducted via Analysis of Variance (ANOVA) and Chi-square tests. Findings from the study revealed that income and age were the key determinants of respondents' investment in cryptocurrency in India.

In the study conducted by Grew (2023), an analysis was undertaken to assess the risk and return characteristics of cryptocurrencies in comparison to more conventional assets. This evaluation employed a Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model to estimate standardized volatility. Furthermore, the research utilized the Sharpe ratio, a metric indicating the risk-return profile of a portfolio. The findings of the study indicated that, according to both the GARCH model and the Sharpe ratio, cryptocurrencies exhibited significant risk; nevertheless, the returns generated surpassed the associated risks.

3.0 Methodology

This study employed the survey research design where questionnaire was designed and administered among the undergraduate students of Olabisi Onabanjo University (OOU), Ago-Iwoye, Ogun State, Nigeria. The choice of Ogun State was based on the fact that the state has the

highest number of Universities in Nigeria while OOU was selected because of its students' population. A pilot test was carried out on a small group of twenty-one (21) students and, on that basis, the questionnaire was adjusted accordingly. Consequently, the adjusted questionnaire was shared among the students via Google form designed for that purpose. The link was shared among the students through various students' WhatsApp groups. At the end of the exercise, a total of two hundred and forty-nine (249) valid responses were used for the study. The details of the responses/respondents are presented in Table 2 below. Meanwhile, the Analysis of Variance (ANOVA) test was employed in testing the difference in the sample mean of the respondents based on their respective levels and faculties.

Table 1: Reliability Test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
0.742	0.715	8

Source: Authors' Computation (2024)

Table 1 above showed the results from the pilot test. The test was conducted to test the reliability of the items contained in the questionnaire. The Cronbach Alpha coefficient of 0.742 (which is greater than 0.70) showed that it is within the acceptable range as outlined by George and Mallery (2003).

4.0 Results and Discussions

Table 2: Respondents' Frequency Distribution

Variables	**Label**	**Frequency**	**Percentage**
Respondents' Gender	Male	88	35
	Female	161	65
	Total	**249**	**100.0**

Respondents' Level	100	22	8.8
	200	42	16.9
	300	19	7.6
	400	153	61.4
	500	13	5.2
	Total	**249**	**100.0**
Respondents' Faculty	Administration and Management Sciences	105	42.2
	Art	18	7.2
	Education	46	18.5
	Law	5	2.0
	Social Sciences	36	14.5
	Total	**249**	**100.0**

Source: Field Survey (2023)

Table 2 above showed that 35 percent of the respondents were male while 65 percent were female. This indicated that majority of the sampled students were female and it pointed to the fact that the University has more female enrolments than male. Meanwhile, 8.8 percent of the respondents were 100 level students of the University, 16.9 percent were 200 level students, 7.6 percent were 300 level students, 61.4 percent were 400 level students while 5.2 were 500 students. This showed that majority of the respondents were 400 students. Therefore, it can be deduced that majority of the respondents are matured and have spent more than two (2) years in the University. Also, it was revealed from the Table 2 that 42.2 percent of the respondents were in the faculty of Administration and Management Sciences of the University, 7.2 percent from the faculty of Art, 18.5 from the faculty of Education, 2.0 from the faculty of Law whereas 14.5 percent came from the faculty of Social Sciences. Furthermore, it can be concluded that majority of the students came from business, accounting and finance related faculty.

4.1 Results of Statistical Tests

Table 3: ANOVA by Faculty

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Cryptocurrencies are very convenient to use everywhere	Between Groups	1.168	5	0.234	0.430	0.828
	Within Groups	132.045	243	0.543		
	Total	133.213	248			
Using cryptocurrency is a good idea	Between Groups	2.279	5	0.456	1.391	0.228
	Within Groups	79.609	243	0.328		
	Total	81.888	248			
Have the mindset to use cryptocurrency	Between Groups	3.693	5	0.739	1.456	0.205
	Within Groups	123.303	243	0.507		
	Total	126.996	248			
Cryptocurrency provides an in-depth access to crypto traceability	Between Groups	1.576	5	0.315	0.794	0.555
	Within Groups	96.424	243	0.397		
	Total	98.000	248			
Applications of cryptocurrency are well-known and familiar to me	Between Groups	5.334	5	1.067	1.901	0.095
	Within Groups	136.385	243	0.561		
	Total	141.719	248			
Cryptocurrency can be used for	Between Groups	1.476	5	0.295	0.743	0.592

efficient monetary transactions	Within Groups	96.484	243	0.397		
	Total	97.960	248			
Cryptocurrency is used in criminal activities	Between Groups	.536	5	0.107	0.148	0.980
	Within Groups	175.496	243	0.722		
	Total	176.032	248			
Using and storing crypto assets can be a significant hazard to new users	Between Groups	2.782	5	0.556	1.029	0.401
	Within Groups	131.443	243	0.541		
	Total	134.225	248			

Level of Significance = 5%

Source: Authors' Computation (2024)

Table 3 above reports the results of the test of hypothesis one which stated that there is no significant difference in the perceptions of sampled undergraduate students across faculties on cryptocurrency. The hypothesis was tested with all the statements in the questionnaire. Each of the statements produced a low F-ratio with p-value higher than 0.05. The null hypothesis was accepted while the alternative hypothesis was rejected. Therefore, it was concluded that there is no significant difference in the perceptions of sampled undergraduate students across faculties of the respondents on cryptocurrency.

Table 4: ANOVA by Level

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Cryptocurrencies are very	Between Groups	3.780	4	0.945	1.782	0.133

convenient to use everywhere	Within Groups	129.433	244	0.530		
	Total	133.213	248			
Using cryptocurrency is a good idea	Between Groups	2.494	4	0.623	1.916	0.108
	Within Groups	79.394	244	0.325		
	Total	81.888	248			
Have the mindset to use cryptocurrency	Between Groups	4.251	4	1.063	2.113	0.080
	Within Groups	122.745	244	0.503		
	Total	126.996	248			
Cryptocurrency provides an in-depth access to crypto traceability	Between Groups	.887	4	0.222	0.557	0.694
	Within Groups	97.113	244	0.398		
	Total	98.000	248			
Applications of cryptocurrency are well-known and familiar to me	Between Groups	4.385	4	1.096	1.948	0.103
	Within Groups	137.334	244	0.563		
	Total	141.719	248			
Cryptocurrency can be used for efficient monetary transactions	Between Groups	2.024	4	0.506	1.287	0.276
	Within Groups	95.936	244	0.393		
	Total	97.960	248			
Cryptocurrency is used in criminal activities	Between Groups	3.056	4	0.764	1.078	0.368
	Within Groups	172.977	244	0.709		
	Total	176.032	248			

Using and storing crypto assets can be a significant hazard to new users	Between Groups	2.511	4	0.628	1.163	0.328
	Within Groups	131.714	244	0.540		
	Total	134.225	248			

Level of Significance = 5%

Source: Authors' Computation (2024)

Table 4 above contains the results of the test of hypothesis two which stated that there is no significant difference in the perceptions of sampled undergraduate students across levels on cryptocurrency. The hypothesis was tested via all the statements in the questionnaire. Each of the statements used produced a low F-ratio with p-value higher than 0.05. The null hypothesis was accepted while the alternative hypothesis was rejected. Therefore, it was concluded that there is no significant difference in the perceptions of the sampled undergraduate students across levels of study on Cryptocurrency.

Furthermore, the results showed that majority of the sampled students are familiar with Cryptocurrency applications; they agreed to the fact that Cryptocurrencies are very convenient to use; and they have the mindset to use Cryptocurrency. Besides, the results as shown in Tables 3 and 4 showed that there is no significant difference in the perceptions of the sampled undergraduate students across the respondents' faculties and levels on the use of Cryptocurrency. Therefore, the students are ready to embrace the use of Cryptocurrency products. These findings are in line with the propositions of unified theory of acceptance and use of technology. Moreso, the findings are supported by the works of Poongodi and Anandraj (2023) and Ebizie, Nkamnebe and Ojiaku (2022) where the adoption of cryptocurrency was affirmed. However, the findings are not in agreement with the works of Adamu, Magaji and Angara (2021) where only a few young individuals were found to have embraced the use of cryptocurrency.

5.0 Conclusion and Recommendations

The study investigated the perceptions of undergraduate students of Olabisi Onabanjo University on cryptocurrency. Two (2) research hypotheses were formulated and tested via the ANOVA test based on the study's research questions and objectives. A total of two hundred and forty-nine (249) validly completed (via Google forms) questionnaires were used for the study. The study, therefore, concluded that majority of the undergraduate students of Olabisi Onabanjo University have embraced cryptocurrency applications/products. Besides, the study recommended the need for the "National Universities Commission (NUC)" to complement the curriculum of each of the courses in the existing thirteen (13) disciplines as contained in the newly introduced "Core Curriculum and Minimum Academic Standards for the Nigerian University System (CCMAS)" with elements of e-banking. For instance, as contained in the curriculum of BIT 323 – Elements of e-money and e-banking Technology of B.Sc. Business Information Technology programme. This is to educate students on the benefits, challenges and hazards of Cryptocurrency applications/products as well as the other e-banking channels. Furthermore, there is the need for the Nigerian government to introduce a legislation that governs Cryptocurrency activities in the country.

REFERENCES

Afolabi, M. O., Adebisi, Y. A., & Samuel, O. A. (2019). Cryptocurrency: A new form of investment. Heliyon, 5(11), 1 – 27.

Agama, E. J. & Akanegbu, B. N. (2022). Examining the impact of crypto currencies on macroeconomic variables in Nigeria. *Journal of Banking*, 10(2), 1 – 22.

Ajzen, I. (1985). The theory of planned behavior: Frequently asked questions. *Human behavior and emerging technologies*, *2*(4), 314 – 324.

Al-Suqri, M. N., & Al-Kharusi, R. M. (2015). Ajzen and Fishbein's Theory of Reasoned Action (TRA) in information seeking behaviour and technology adoption: Theories and trends. *IGI Global*, 188 – 204. https://doi.org/10.4018/978-1-4666-8156-9.ch012

Bala, A. M., Abdullahi, M. A., & Abdullahi, A. U. (2021). An assessment of the level of adoption of cryptocurrencies among students of tertiary institutions of Sabon gari and Zaria local government areas of Kaduna state, Nigeria. *Arts and Social Science Research*, *11*(1), 174 - 186.

Davis, F. D. (1989). Technology acceptance model: TAM. *Al-Suqri, MN, Al-Aufi, AS: Information Seeking Behavior and Technology Adoption*, 13(1), *205* – 219.

Dwivedi, Y. K., Rana, N. P., Janssen, M., Lal, B., Williams, M. D., & Clement, M. (2017). An empirical validation of a unified model of electronic government adoption (UMEGA). *Government Information Quarterly*, *34*(2), 211 – 230.

Dwivedi, Y. K., Rana, N. P., Jeyaraj, A., Clement, M., & Williams, M. D. (2019). Re-examining the unified theory of acceptance and use of technology (UTAUT): Towards a revised theoretical model. *Information Systems Frontiers*, *21*, 719 – 734.

Ebizie, P. I., Nkamnebe, A. D., & Ojiaku, O. C. (2022). Factors Influencing Cryptocurrency Adoption Among Nigerian University Fintech Entrepreneurs: An UTAUT perspective. *British Journal of Marketing Studies*, *10*(3), 25 – 37.

Famuyide, O. O., & Adeyemi, S. L. (2020). Bitcoin and its adoption in Nigeria: An empirical investigation. Cogent Economics & Finance, 8(1), 17 - 42. Finance Act (2023). Abuja: *Laws of the Federal Republic of Nigeria.*

George, D. & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. Eleventh edition, Boston: Allyn & Bacon.

Grew, H. J. (2023). An empirical review of the relationship between risk and return of cryptocurrencies. *Essex Student Journal*, *14*(1), 1 - 27. doi: https://doi.org/10.5526/esj162

Halaburda, H., Haeringer, G., & Gans, J. (2020). *The microeconomics of cryptocurrencies* (No. 14972). CEPR Discussion Papers.

Nwosu, O. U. (2021). *The impact of cryptocurrencies on financial inclusion among Nigerian youths* (A case study of Lagos state residents). Doctoral Thesis, Department of Economics, Faculty of Social Sciences, University of Lagos.

Okpalaojiego, E. C. (2021). Effects and implications of cryptocurrency ban on Nigerian economy. *Academic Journal of Current Research*, *8*(4), 23 – 33.

Olugbenga, A. J. (2018). Cryptocurrency and the prospect of Nigerian economy. *International Journal of Economics Management and Research*, 1(7), 185 – 192.

Osagwu, A. O., & Okafor, E. G. (2022). Understanding the Nexus Between Advertising and Purchase Intention of Cryptocurrency Among Young Adults in Nigeria. *European Journal of Business and Innovation Research*, *10*(6), 34 – 70.

Platt, M., Ojeka, S., Dragnoiu, A. E., Ibelegbu, O. E., Pierangeli, F., Sedlmeir, J., & Wang, Z. (2023). Energy demand unawareness and the popularity of Bitcoin: evidence from Nigeria. *Oxford Open Energy*, 2(1), 1- 18.

Poongodi, B. & Anandraj, K. (2023). Awareness of cryptocurrency among public: Evidences from Tamilnadu state. *International Journal for Multidisciplinary Research*, 5(6), 1 – 22.

Sauer, B. (2016). Virtual currencies, the money market, and monetary policy. *International Advances in Economic Research*, 22(2), 117 – 130.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science*, *46*(2), 186 – 204.

Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 36(1), 157 – 178.

Williams, M. D., Rana, N. P., & Dwivedi, Y. K. (2015). The unified theory of acceptance and use of technology (UTAUT): A literature review. *Journal of Enterprise Information Management*, *28*(3), 443 – 488.

Yuksel, I. (2015). Rogers' diffusion of innovation model in action: Individual innovativeness profiles of pre-service teachers in Turkey. *Croatian Journal of Education-Hrvatski Casopis Za Odgoj I Obrazovanje*, *17*(2), 21 – 39.

APPENDIX: QUESTIONNAIRE

DEPARTMENT OF ACCOUNTING
FACULTY OF ADMINISTRATION AND MANAGEMENT SCIENCES,
OLABISI ONABANJO UNIVERSITY
AGO-IWOYE, OGUN STATE

Dear Respondent,

REQUEST FOR THE COMPLETION OF QUESTIONNAIRE

The research is being conducted to examine the perceptions of undergraduate students of Olabisi Onabanjo University, Ago-Iwoye on Cryptocurrency. The questionnaire is strictly designed for the research purpose. Your opinion on the subject matter will be highly confidential.

Thanks for your cooperation.

Researchers:

Alao, A. Adeniyi
Odunsi, O. Temitayo

SECTION A: DEMOGRAPHIC DATA

1. **Gender:** Male ( ) Female ( )

2. **Level:** 100L ( ), 200L ( ) 300L ( ) 400L ( )

3. **Faculty:** Administration and Management Sciences ( ) Social Sciences ( ) Art ( )

   Education ( ) Law ( ) Science ( )

SECTION B: HYPOTHESES QUESTIONS

In this section, kindly select the option that best describes your opinion. SA = Strongly Agree, A = Agree, D = Disagree, and SD = Strongly Disagree

S/N	Items	SA	A	D	
	Cryptocurrencies are very convenient to use everywhere				
	Using cryptocurrency is a good idea				
	Have the mindset to use cryptocurrency				
	Cryptocurrency provides an in-depth access to crypto traceability				
	Applications of cryptocurrency are well-known and familiar to me				
	Cryptocurrency can be used for efficient monetary transactions				
	Cryptocurrency is used in criminal activities				
	Using and storing crypto assets can be a significant hazard to new users				

Lending rate, Exchange Rate and Household Consumption Relations in Sub-Saharan Africa: Mean Group Approach

****

Abayomi Toyin Onanuga[1] & Sheriffdeen, Adewale Tella[2]

Abstract

Household consumption expenditure in Africa to the world aggregate is comparatively low, considering the population in the region. However, empirical evidence on how the cost of consumer consumer credit and exchange rate affects household consumption in Sub- Saharan African countries is very terse in spite of the rising population in the region. In view of this the paper examined how household consumption responds to maximum lending rate and exchange rate in the region. The study employs the mean group econometric technique for analysis of the panel data, which is made up of 37 African countries covering a period of 2008 - 2017. This study found that at 5% level of significance lending rate coefficient (0,228) and exchange rate coefficient (0.031) induced positive changes on household consumption in SSA within the period of the study. The study concluded that lending and exchange rates have significant affects on household consumption in SSA. We therefore recommend that if the monetary policy makers in respective SSA countries to formulate policies that steadily reduces the cost of credit and stabilize exchange rate so as to improve substantially household consumption in the region.

[1-2] *Department of Economics Olabisi Onabanjo University, Ago-Iwoye, igeria*

Keywords: Household consumption; Lending rate; Exchange rate; Mean group, Panel data
JEl Classification: E21; E43; F31; C21; C23

1. Introduction

The cumulative household consumption of Africa to the world aggregate is relatively low, considering the population of the region. This is in spite of the fact that Africa is next to Asia in terms of population density. In the period 2008-2018, Sub-Sahara African (SSA) countries and North Africa (NA) average household consumption was just 2.42% and 1.13% out of the total household consumption of the world. Whereas, Asia, Europe, North and South America average household consumption were 28.90%, 25.78% and 39.77% respectively. (UN statistical database, 2020).

The apparent relative global low consumption pattern in African households demand for an empirical study to find out the essential drivers of household consumption within the context of the cost of consumer credits and exchange rate movement. In an integrated global economy amidst globalisation and increased continental trade agreements like the African continental free trade agreement (AfCTA), exchange rate movement becomes essential for enhancing consumption growth or otherwise (Bahmani-Oskooee, Kutan, & Xi, 2015). Virtually all SSA countries have had to devalue or face currency depreciation coupled with a high lending rate that has redefined their wage-inflation relations in the last decades. Considering currency devaluation that has long characterised the financial framework in sub-Sahara African countries, inflating commodity prices is inevitable for businesses to stay afloat in a dynamic, challenging and import-dependent economic systems (Duca-Radu, Kenny, & Reuter, 2020). The inflationary inclination of essential domestic commodities erodes the market value of disposable income of SSA households leading to socio-economic hardship and widening inequality (Iddrisu & Alagidede, 2020). Even when nominal national wages are reviewed upward as it is the case of the Nigerian government,

yet to be fully implemented minimum wage upward review, long-adjustment lags in the wage-inflation relations will ensure household consumption fall below the inflation-triggered devaluation since poor households mostly have a high marginal propensity to consume (MPC) (Alexander, 1952). Access and high lending rate for households in many Sub-Sahara African (SSA) countries is likely to be one of the challenges confronting many households who desire to improve on their consumption pattern. Due to the foregoing, it becomes apt to lean empirical credence to the lending, exchange rates and consumption relations in SSA in order to find out how evidence can guide government policy adjustments and research effots on the issue.

While it is essential to analyse the fundamental elements driving consumption in SSA because of its growth-inducing capacity, it is surprising to find out that lending rate, exchange rate and consumption relations have not been given the optimum research attention in Africa. Whereas, a large and active body of research on the lending, exchange rate and consumption relations have been reasonably conducted in industrialised economies (Iyke & Ho (2019); Chishti et al. (2019); Arapova (2018); Varlamova & Larionova (2015); Bahmani-Oskooee (2011) and very few on emerging economies (Bahmani-Oskooee et al., 2015) to guide policy and determine what emboldens household consumption. This is unexpected for SSA because of the chain relationship between consumption and production. Relying on the chain relationship, lack of evidence on the testable response of household consumption expenditure to lending rate may be one of the reasons for lack of conducive policy on how SSA can enhance growth by leveraging on mass consumption. This view is not a gainsaying because evidence by a study in Asia has found that private consumption is also a driver of growth even at a higher rate than exports (Economic and Social Survey of Asia and the Pacific, 2016).

We aim to establish a clear line of thought on the lending, exchange rate and consumption relation in SSA due to the thin study on the Africa

experience; ii), to determine the effect of lending rate on household consumption in the region and iii), to investigate the effect of exchange rate on household consumption in the region.

Apart from income, of the many factors that have been found to be a conspicuous aid to mass consumption is the provision of credit with the attendant cost. Kumar, Bhutto, Mangrio & Kalhoro (2019); Christensen, *(2012);* Logemann (2008); Taylor (1995); Bernanke & Getler (1995); Blare (1978). Therefore, access to credit through a liberalised credit evaluation system at affordable cost is essential in creating a consumer-led continent. Although, findings from some studies have affirmed the response of consumption to household income since the middle of the 20th century in many countries (see: Keynes, 1936; Friedman, 1957; Modigliani & Ando, (1975); Jappeli & Pistaferri (2010); Stevens & Unayama (2011); Mankiw & Campbell (1991) attaining mass consumption may not be substantially achieved through disposable income source(s) alone in SSA. Based on this notion, investigating the extent to which cost of credit aids consumption or otherwise in SSA is important for policy design if the region intends to attain mass consumption.

The linkage between the exchange rate via inflation to consumption was explained by Alexander (1952). If a foreign country devalue or revalue its home currency a trading parner in another country might experience a shock to domestic inflation. If an assumption is made such that SSA depends on the importation of durable and non-durable commodities or goods. The absorption theory of devaluation emphasise that currency devaluation may lead to inflationary trends in a domestic economy partly because of price adjustment caused by currency depreciation in another country (Alexander, 1952). The inertia in wage adjustment makes a consumer in any country to adjust his consumption pattern in line with changes in domestic prices of goods gradually. The changes in nominal exchange may also account for a considerable shift in the import prices in the countries over a time frame (Ha, Stocker &, Yilmazkuday 2019). This

may be particularly prevalent in SSA, which operates few production plants but consumes largely manufactures goods.

Our conjecture for this paper is that borrowing affects consumption via changes in the lending rate, and exchange rate affects consumption through inflation. We established the steepness of lending rate applied by banks in SSA and the overriding consequences for household consumption in SSA. We further clarify age-long ambiguity in the exchange rate-consumption expenditure relations in SSA due to the high import-dependent nature of the region. In repect of econometric method employed by the study, we emphasise that a specific bias arises if our empirical model is subjected to a fixed and random effects instrumental variable (IV) estimation in the face of slope heterogeneity. Due to the fact that the response of household consumption to exchange and lending rates has been widely investigated in panel data analyses for many climes using econometric methods that assume the elements of the cross-section are independent and the slope is homogeneous. The paper argues that in practice, heterogeneity of slopes is a reality among the cross-section. These estimators that have been applied over time in the literature may lead to inefficient estimates and inconsistent standard errors (Ali, Yusop, Kaliappan and Chin, 2020); (Everaert and Groote, 2014) These econometric analytical issues are borne from the fact that some unobserved common factors may affect countries uninformedly and such shocks may be time-invariant across sample countries. In addition, Eberhardt and Teal (2010) avers that unobservable common factors and the pattern of the regressors in the cross-section may lead to the violation of homogeneous slopes as well as cross-sectional independence.

Due to the challenges of cross-sectional dependence and possible homogenous slopes related to panel data analysis, the coefficients can still be estimated using using the mean group (MG) method of analysis. Because Peseran (2015) affirms that after estimation of the model, a weak cross-sectional dependence can be tested for.

Relying on the recent econometric analytics' contribution to the literature, this study adopts the mean group (MG) approach for analysis in this paper. This is perhaps, one of the contemporary papers that is applying such an econometric methodology on household consumption data in the region. We found that the maximum lending rate and exchange rate significantly affected household consumption positively in SSA. This finding provide ample evidence for policy guide on how to significantly improve household consumption in SSA and by extension a paradoxical contribution to the existing literature. The subsequent part of the paper is structured as in the following pattern - part two reviews theory and evidence and section three discusses methodology. Part four and five contains the results, conclusion and recommendations.

2. Literature Review

Economic theory on consumption and personal income was revolutionised by Keynes (1936). He postulated that consumption has a positive functional relationship with current disposable income, while Friedman (1957) expressed the view that consumption depends on permanent and transitory income. Duesenberry (1949) emphasised the interdependency of current personal income and private consumption and the model for a life cycle planning horizon of how consumption depends on income was discussed by Modigliani and Ando (1975). Earlier than Keynes (1936), the theoretical model, which emplaced borrowing for consumption was explained by Irving Fisher (1867-1947). He explains how the budget of a consumer can limit the choice of a consumer in a two-period (present and future) horizon. The lending rate can influence consumption because the consumer can borrow or lend between the periods. Furthermore, on the linkage of interest rate and personal consumption, the New Keynesian assumed that nominal rigidities of prices (current market price of interest rate) affects current consumption more than future consumption. (Cloyne, Ferreira & Surico, 2015).

The relevance of the narrow credit channel emphasised how a central bank can contract or expand the lending ability of commercial banks by

adjusting the policy rate or buying or selling securities in the open market. The action of the monetary authorities if contractionary, it will reduce commercial banks aggregate deposit and subsequently, their lending functions (Bernanke & Getler 1995). Although the theory has been criticised by Disyatat (2011), and he argues that the emphasis of Bernanke and Getler (1995) about changes in banks deposit due to monetary policy shocks is mislaid. Instead, he proposed that monetary transmission through the bank lending channel affects the bank's reactions through their external finance premium. Disyatat (2011) emphasised the lending rate as a constraint factor that drives loan rather than the deposit level of banks.

How exchange rate affected personal consumption was primarily established by the study of Alexander (1952). He discussed how the devaluation of a country's exchange rate affects foreign trade with other countries. This is due to increase in the cost of import due to depreciation. Because the rate of marginal change in the demand for imports explains the degree of price variation. However, a pass-through effect of currency devaluation by a foreign country may be passed to the importing nation in full or smaller proportion. This is reflected in the domestic price of the importing country. It is instructive to say that the theoretical literature had established the notion that consumption decisions are directly linked to income but an indirect chain relationship with lending and exchange rates**.**

The evidence reviewed on studies relating to the linkage between the household consumption and the lending and exchange rates suggest that the results are diverse depending on the country and the type of interest rate employed by the study. In Nigeria, Babangida Sanusi and Yusuf (2021) found that real exchange rate significantly affected domestic consumption negatively. This implies that as real exchange rate rises, domestic consumption declines. In respect of emerging economies in Africa, Gohar et al. (2023) found that variation of exchange rate asymmetrically affects household consumption for emerging countries aside from Nigeria. A country specific study by Babangida Sanusi and Yusuf (2021) earlier found that exchange rate and domestic consumption

are inversely related. Ekong and Effiong (2020) in respect of a study on Ghana and Nigeria, they found a negative relationship between savings and interest rate on household consumption. Whereas, Fadhil and Rajab (2021) conducted a research on how consumption responded to interest rate in Tanzania and they found that interest rate does affect household consumption in the country.

Mankiw (1985), examined how consumption responds to the real interest rate. The findings from the study suggest that expenditure incurred on durable consumer goods reacts at a faster rate to changes in the real interest rate compared to money expended on non-durable consumer goods. Unlike Mankiw**,** Wilcox (1990) analysed how the real and nominal interest rates affects consumption. He found that consumption responds to nominal interest rates significantly whereas the real interest rate does not due to the lenders prescription condition of a stipulated payment to current income ratio before lending. Furthermore, he found that non-durable consumer goods and services also responded to variations in the interest rate.

Acting on the argument that low-interest rate discourages United States of America (USA) banks from funding consumption need of the people Christensen (2012) found that by keeping the interest rate low in the USA the monetary authorities maximises consumption. He used a 50-year data to track the optimal interest rate, which supports increased consumption in the country. In Germany and contrary to the USA's experience, evidence obtained by Hermann-Josef (1996) suggest that interest rate is not a primary determinant of consumption in the country. Chishti, Azeem, Mahmood, and Sheikh (2019) conducted a study that compared how volatile exchange rate pattern affected consumption in some countries (developed, emerging developing) using a panel data for 1995-2017. The study affirms that volatile exchange rate affected the pattern of consumption in developed countries but for emerging and developing countries, volatile exchange rate has no significant affect on aggregate consumption. In SSA, Oseni (2016) affirms that consumption does not

respond to volatile exchange rate in 1999 -2014. Oseni's findings differ from the result of Chishti et al. (2019), which found that consumption responded to volatile exchange rate. This may be as a result of different econometric technique for analysis as well as different study period and cross-sectional data employed.

Bahmani-Oskooee and XI (2015) in a sample of 17 countries in some advanced economies, confirms that volatile exchange rate variation affects consumption in the immediate period. The result is similar to that of Oseni (2016) that considered 19 countries in SSA having used different econometric approach. Kumar et al. (2019) finding in a study on Pakistan, suggest that volatile exchange rate and interest rate in the long-run affected consumption

Although some country specific studies have been conducted. Even at that, most of the empirical studies did not investigate the two explanatory variables in a single paper for country specifics studies. Few panel study analysis were based on developing countries in Asia and some emerging economies in Europe. Therefore, evidence reviewed by the study suggested a dearth of studies on SSA in this area. This is the empirical gap filled by this paper.

3. Methodology

3.1 Identification Strategy

In this study, the identification strategy that captures the response of household consumption to lending and exchange rates in SSA relies on the work of Pesaran and Smith (1995). However, improved contribution to the estimator has been advanced by Pesaran (2006) and the augumented model specified in Eberhardt and Teal (2010). Prior to the development of these estimators' panel data estimators revolves around the fixed and random effects which assumes homogeneity of regressors (fixed effects) and changes in the cross-sectional intercepts (random effects). In this paper, we compare the fixed, random and mean group estimators due to

the increasing concern of slope heterogeneity and cross-sectional dependence mostly found in panel data of N by T observations.

The theoretical framework adopted for the fixed and random effects estimators relied on the regressors impulse that employs the instrumental variable (IV) model. The structure of the panel data is expressed in the form x_{it} , $i = 1, \ldots . N, t = 1, \ldots . T$ *N* denotes the cross-section and *T* the time-series dimension of the panel. Using the linear regression technique, the fixed effect estimator is consistent if $N \rightarrow \infty$ and *T* are finite. However, if the expected $\mathrm{E}(x_{jit}, \varepsilon_i) = 0$ and $\mathrm{E}(x_{jit}, \varepsilon_i) \neq 0$ the fixed effects estimation is efficient if the regressors are correlated with ε_i but less efficient than the estimation of the random effects if $\mathrm{E}(x_{jit}, \varepsilon_i) = 0$.

Relying on Greene (2008. p 287-297), the fixed effect (FE) and random effect (RE) models in their implicit form is expressed in equations (1) and (2) respectively.

$$y_{it} = \varepsilon_i + X'_{it}\boldsymbol{\beta} + \delta_{it} \quad \ldots.(1)$$

Where *it* represents the cross-section and time-series dimension, respectively. *X* represents a *K* vector of regressors, *y* is the regressand, $\boldsymbol{\beta}$ is a [*K x1*] vector of slopes, ε_i is the time-invariant differences between the cross-section while δ_{it} is the error term that varies over *i* and *t* .

The random effect (RE) model in the implicit form in equation (2):

$$y_{it} = \alpha_0 + X'_{it}\boldsymbol{\beta} + \varepsilon_i + \delta_{it} \quad \ldots(2)$$

$$\varepsilon_i \sim iid(0, \sigma_\varepsilon^2) \qquad \delta_{it} \sim iid(0, \sigma_\delta^2)$$

All the notations stand as previously explained in equation (1) except that the value of ε_i is one of the constituents of the error specifically for each member of the cross-section with a distribution that is independently and identically distributed with a mean of zero and constant variance. δ_{it} is

another constituent of the error term with the same features of ε_i but it is not correlated to the cross-section and time dimension. In addition, α_0, captures the overall mean, both $\varepsilon_i \; and \; \delta_{it}$ are mutually independent and are also independent of all the X_s. This study employs the generalised least square (GLS) method for analysing the baseline empirical model expressed in equation (3) because the OLS approach does not accommodate the data generating process of the error structure of equation (2).

$$lnHCE_{it} = \vartheta_i + \gamma_t + \omega X_{it} + \beta Y_{it} + \epsilon_{it} \quad \ldots(3)$$

The symbols in equation (3) are as follows; lnHCE is the log of real household consumption expenditure, *i* represent the cross-section of sample countries in SSA and *t i*s the time-series dimension of the panel. ϑ_i is the country fixed effect, the year fixed effect is represented by γ_t. X is the vector (K x 1) of regressors, which are lending rate, the exchange rate, implicit price deflator and log of real per capita income. The last two variables account for inflation and income effects to minimise the effect of omitted variable bias.

Our anxiety for the possibility of endogeneity for the model (3) is the link amongst per capita income, exchange rate and household consumption expenditure. An increase in income may lead to an increase in consumption. This is expected at the aggregate level based on the consumption function theory. In addition, a shock to the exchange rate might affect household consumption, especially for durable goods if the importer adjusts up the domestic price of the goods to account for domestic currency devaluation. Given the endogenous relationship of the study variables we employ the instrumental variable (IV) econometric approach using the lag of implicit price deflator and lag of lending rate which from the results in Table 2 may be correlated with regressors but not with the errors of the dependent variable (Z_{it}).

In equations 4 - 6, relying on Peseran and Smith (1995) and Pesaran (2006) and considering the concern for the assumption of homogeneous

slope in fixed effect panel model, this study assumes a linear heterogeneous slope panel data model in the form:

$$y_{it} = \alpha_i' x_{it} + \delta_{it} \quad \ldots (4)$$

$$\delta_{it} = \varphi_{1i} + \gamma_i' f_t + \epsilon_{it} \quad \ldots (5)$$

$$x_{it} = \varphi_{2i} + \gamma_i' f_t + \vartheta_i' g_t + \mu_{it} \quad \ldots (6)$$

where y_{it} is the log of household consumption expenditure while x_{it} represent a vector of $k\ x\ 1$ explanatory variables, which can be observed at time *t* in the *ith* cross-section of the sample countries in SSA. α_i are individual county slopes and δ_{it} are the error term assumed to follow a white noise process with respect to the cross-section and time. In Equations (2 and 3) φ_i is the cross-section fixed effects that apprehends the time-invariant heterogeneity of the sample countries. f_t and g_t are vector of $k\ x\ 1$ unobserved common factor loading and heterogenous factor loadings. γ_i and ϑ_i are the individual country factor loadings for the dependent and the independent variables, respectively. In accounting for the latency of unobserved common factors, Pesaran (2006) included cross-section mean of the response variable as well as the mean of the regressors in the equation estimated. The inclusion of these averages sieves out the cross-correlated effects (Pesaran, 2006). Furthermore, ϵ_{it} and μ_{it} are the error term, which are also assumed to follow a white noise process, respectively. But the inclusion of f_t in equations (2) and (3) allows for endogeneity in the baseline equation estimated (Eberhardt and Teal 2011). Based on the foregoing identification design, the paper applies the mean group approach by Pesaran and Smith (1995) estimator to derive consistent and efficient coefficient estimates for the response of household consumption to lending and exchange rates in SSA.

3.2 Empirical Model and Estimation Approach

In order to facilitate the econometric modelling of the effect of interest and exchange rates on household consumption in Sub-Sahara Africa, the study adopts a balanced panel data that relies on the mean group (MG) econometric technique. Relying on the identification scheme explained in

the previous section of this paper, the baseline model that is estimated for this paper is equation 7.

$$y_{i,t} = \vartheta_i + \alpha_1 Exc_{i,t} + \alpha_2 lrt_{i,t} + \alpha_3 ipd_{i,t} + \alpha_4 lnrpci_{i,t} + \epsilon_{i,t} \quad \ldots 7$$

where $y_{i,t}$ is the log of household consumption expenditure, $Exc_{i,t}$ is the log of the exchange rate, $lrt_{i,t}$ is the lending rate and $ipd_{i,t}$ is the implicit price deflator. And $\epsilon_{i,t}$ is the error term that follows a white noise process.

The estimators employed in this study is the mean group (MG) econometric approach. After the discussion of the descriptive statistics of the study, the study estimates the coefficient values of the empirical model using the two-stage least squares (2SLS) instrumental variable (IV) *menu* estimators, which include the fixed and the random effects estimators. The results in Tables 3 and 4 affirms the existence of slope heterogeneity and cross-sectional dependence of the sample observations. This renders the panel fixed and random effects estimators though consistent but inefficient and the standard errors, are biased and inconsistent due to the correlation between the observed regressors and unobserved common factors (Everaert and Groote 2014; Pesaran 2006). The study employs the MG estimator that produces the cross-section average of the coefficient estimates for the countries in SSA and test for weak cross-sectional dependence propounded by Pesaran (2015). The main limitation of the paper for not considering the common correlated effects estimator is due to the fixed time (T) series, which may not provide robust estimates.

3.3 Data and Sources

The study employs a sample of 37 countries in SSA[3] using annual data for 2008-2017. The choice preference for these countries enabled us to have a balanced panel data. Furthermore, the SSA countries that are not

[3] Angola, Benin, Botswana, Cameroon, Carbo Verde, Central Africa, Chad, Comoros, Congo Democratic Republic, Congo Republic, Cote d'Ivore, Equatorial Guinea, Gambia, Gabon, Guinea Bissau, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome, sierra Leone, Senegal, South Africa, Tanzania, Togo, Uganda, and Zambia.

included in the cross-section lacks data on either the exchange rate or lending rate for the period of the study. Data are obtained from the United Nations Statistical Division database (UNSTATD) (2020) and the International Monetary Fund (IMF) country by country data of the International Financial Statistics (IFS) (2020) and World Bank database World Development Indicators (WDI) (2020). From these sources, the paper employs a balanced panel data of N = 37 and T = 10. The explained variable is the real household consumption expenditure for each of the sample countries at constant 2015 prices in the United States of America (USA) dollars. The explanatory variables are; per capita income, which is proxy for the personal income of the sample countries at constant 2015 prices in USA dollars. The exchange rate is proxy by the domestic currency of each country to the USA dollar per period average for each of the years. The other explanatory variable is the implicit price deflator of the gross domestic price index in USA dollars. The real household consumption expenditure and the per capita income are transformed into natural logarithms while the other three variables are used for estimation in their present form.

4. Results

4.1 Descriptive Statistics and Pairwise Correlation

The descriptive statistic test results contained in Table 1 measures the mean, dispersion and the distribution of the variables of the study. All the variables suffer from asymmetry within the period of the study, and this may be one of the reasons for the wide dispersion between the mean and the standard deviation, especially for real household consumption. However, the covariates exhibit wide dispersion except for the lending rate.

Table 1: Descriptive Statistics

	lnRHCE	LRT	EXCR	IPD	lnRPCI
Mean	22.595	13.421	618.937	108.826	7.144
Median	22.595	10.988	592.610	106.190	7.038
Maximum	26.695	65.420	3611.220	153.452	9.673
Minimum	17.985	2.450	3.745	72.079	5.808
Std. Dev.	1.553	11.109	433.267	15.803	0.946
Skewness	-0.046	2.157	3.729	0.478	0.772
Kurtosis	4.275	8.747	21.686	3.322	2.607
Jarque-Bera	25.196	796.059	6240.829	15.69	39.110
Probability	0.000	0.000	0.000	0.000	0.000
Observations	370	370	370	370	370

Source: Authors Computation (2023)

Asymmetry of the distribution of the study variables is also confirmed by the value of skewness as shown in Table 1. Three of the regressors are positively skewed while the rate of exchange and household consumption variable are negatively skewed. The findings suggest that the observations of the two variables are clustered in opposite directions amongst the cross-sections and in time. Kurtosis estimates are peaked. And with a positive value of more the 3, except per capita income. Other variables have heavier tails, which is higher than a normal distribution. In summary, the descriptive statistics corroborate the Jarque-Bera p-value of asymmetry of distribution of the data in time and among the cross-sections.

The pairwise correlation results in Table 2 suggests that the real household consumption significantly correlates with the real per capita income and there is no significant relationship with all other independent variables. In addition, the covariates of the study exhibit significant correlation between and among them. The inference from this result is that there may be a tendency for a cross-sectional dependence between the dependent variable and its covariates. Further to the result in Table 2, the paper conducts the cross-sectional dependence test of the samplefor the study. The result is contained in Table 4.

Table 2: Correlation Matrix Results

	Lnrhce	Lrt	excr	ipd	Lnrpci
lnrhce	1.000				
lrt	0.080 1.535	1.000			
excr	0.021 (0.421)	0.135 (2.614) *	1.000		
ipd	-0.052 (-0.995)	-0.262 (-5.200) *	-0.123 (-2.379) *	1.000	
lnrpci	0.266 (5.298) *	-0.154 (- 2.982) *	-0.195 (-3.807) *	0.137 (2.655) *	1.000

Source: Authors Computation (2023)

* indicate "t" distribution at 5% level of significance
t-statistic is in parenthesis.

4.2 Slope homogeneity and Cross-sectional Dependence Result

Slope homogeneity test by Pesaran and Yamagata (2008) states that the null hypothesis states that the slope coefficients of the regressors are homogeneous. Results in Table 3 affirms that the study rejects the null hypothesis in favour of the alternate hypothesis. Despite the heterogeneity of the slope regressors, the fixed effects estimator still allows for the estimation of the panel data, which assumes that the unobservable factors are taken for granted.

Table 3: Slope Homogeneity Result

Test	statistic	p-value
$\overline{\Delta}$	5.718	0.000*
Adj$\overline{\Delta}$	8.086	0.000*

Source: Authors Computation (2023)

*indicate 1% level of significance

In addition to the slope homogeneity test reported in Table 3, Table 4 contains the cross-sectional dependence test, which is another major contemporary issue in panel data analysis. The null hypothesis of the test by Pesaran (2015), Frees (1995) and Friedman (1937) is that there is cross-sectional independence among the cross-sections that represent the sample of a panel data. Nevertheless, the null hypothesis is rejected by the three tests (see Table 4). The evidence infers that there is cross-sectional dependence among the countries of study.

Table 4 Cross-sectional dependence Result

Type of CD Test	CD Test Value	p-value	Frees LoS	Frees CV	Frees TS
Pesaran	43.359	0.000*			
Friedman	183.009	0.000*			
Frees			10%	0.2559	
Frees			5%	0.3429	
Frees			1%	0.5198	
Frees TS					13.585

Source: Authors Computation (2023)

*indicate 1% level of significance
CD – cross-sections; LoS – level of significance; CV – coefficient value; TS – test statistic

4.3 Regression Result

This section of the paper compares the differences in the coefficient estimates of the fixed and random effects as well as the mean group result. The fixed and random effects models did not consider issues like slope heterogeneity and cross-sectional dependence in determining the coefficient estimates of the regressors. Furthermore, while the mean group derives the mean value for the coefficients of the regressors the fixed effects assumes homogeneity of slopes and random effects allows for individual cross-section effects in determining the coefficient estimates of the three methods.

Table 5: Results of Fixed and Random Effects

	Coefficients Fixed Effect	Coefficients Random Effect	P-value Fixed Effect	P-value Random Effect
Variables				
lrt	-0.008314	-0.007996	0.000*	0.000*
excr	-0.000092	0.000105	0.223	0.156
lnrpci	0.949317	0.892669	0.000*	0.000*
ipd	-0.005607	-0.005505	0.000*	0.000*
_cons	16.47977	16.86153	0.000*	0.000*
rho	0.99213199	0.99195489		
F-test u_i =0	p-value = 0.000*			

Source: Authors Computation (2023)

*; indicate 1% level of significance

Table 5 contains the coefficient estimates of the fixed and random effects models and Table 6 contains the Hausman test that confirms the preferable estimate of the two options. The results from the two methods are proximate but the Hausman test in Table 6 based of the probability of chi-

square of 0.3122 infers that results of the random model is better than the that of the fixed effects. The random model effects results in Table 5 affirms that lending rate negatively affects household consumption in SSA significantly. While exchange rate does not have any significant effect on household consumption in the region The effects of inflation proxied by implicit price deflator suggests that inflation significantly affects household consumption negatively in SSA. The major difference between the fixed effects results and random effects is mainly on the effect of exchange rate on the problem variable. While it is significant based on fixed effects estimation it is not significant from the random effects estimation. The difference in the results for exchange rate might be due to the assumptions on slope homogeneity and individual cross-sections for either of the methods respectively.

Table 6: Hausman Test: Between Fixed and Random Models

Variable	b (fe)	B(re)	b-B difference	SE
lrt	-0.008314	-0.0079958	-0.0003182	0.0002411
excr	0.0000917	0.0001054	-0.0000137	0.0000116
ipd	-0.0056069	-0.0055049	-0.000102	0.00000988
lnrpci	0.9493171	0.8926689	0.0566481	0.0324035

Source: Authors Computation (2023)

Chi Sq; 4.77
Prob of Chi Sq: 0.3122

The mean group estimator coefficient estimate in Table 7 does not assume cross-section in the estimation process, but it includes a linear trend that captures time-variant unobservables (Perasan and Smith, 1995). The coefficient of the regressors in Table 7 also represents the unweighted average of the cross-section (Eberhardt 2012). The 4 explanatory variables included in the fixed and random effect model are also modelled under the mean group estimator. Due to the detection of the existence of collinearity among the 4 variables, the real income per capita was set to

zero. The mean group estimator results also affirmed that the lending rate (0.228) significantly affect household consumption expenditure positively and the exchange rate (0.031) also has a significant positive effect on household consumption in SSA at 5% and 1% level of significance respectively.

Table 7: Mean Group Result

Variables	Coefficient	P-value
lrt	0.228	0.010**
excr	0.031	0.000*
ipd	-0.002	0.283
_cons	4.175	0.004*

Source: Authors Computation (2023)

* and ** indicate 1% and 5% level of significance respectively
lnrt - lending rate; lnexcr - log of exchange rate; ipd – implicit price deflator; _cons - constant

The inference from the mean group results is that a per cent increase in the lending and a unit increase in the exchange rate leads to an increase of 0.228 and 0.031 per cent increase in household consumption respectively in SSA. The study found no evidence that implicit price deflator (a proxy for inflation) significantly affects household consumption. The paradox of the findings from the mean group estimator is that lending rate positively and significatly affects household consumption in the region. The result infers that borrowers are generally unmindful of increasing cost of the lending rate as they tend to ask for more credit to meet their consumption needs in SSA. This may be due low income of the masses who mostly live below a living wage. But must of necessity borrow to feed their respective families. In addition, the high level of unemployment might had necessicitated the need for the masses who form a larger propoportion of the population social class to borrow at any cost for their consumption needs. The exchange rate coefficient also suggest a similar pattern effect on household consumption in SSA. But the parameter is

relatively lower than the lending rate coefficient. A plausible explanation for increased consumption despite the depreciation of the domestic currency against foreign currency is that most of the countries in SSA are largely import-dependent. Therefore, most countries in SSA, depend on imports for non-durable consumer foods as well as manufactured goods. Without any cheaper domestic alternative that can meet the domestic demand of the masses for consumer goods, they are forced to buy regardless of the exchange rate devaluation pass-through effects to domestic prices.

4.4 Test of Weak Cross-sectional Dependence

The weak cross-sectional dependence test results (Pesaran, 2015) in Table 9 rejects the null hypothesis that errors are weakly cross-sectional at 1% level of significance. The paper, therefore, affirms that the errros of the stochastics term are not weakly cross-sectional dependent.

Table 8: Pesaran (2015) test for weak cross-sectional dependence.

CD statistic	P-value
16.181	0.000*

Source: Authors Computation (2023)

H_0: errors are weakly cross-sectional dependent.
* indicates 1% level of significance.

4.4 Discussion of Findings

Based on the mean group approach, the coefficients estimates represent an average effect of lending and exchange rate on household consumption in SSA. The result implies that even if the lending rate increases and the exchange rate depreciates household consumption increases marginally in SSA on the average. The findings of this paper have important policy implications for consumption in the region. Because a decrease in consumer credit, in particular, will encourage a higher level of consumption and this may enhance growth in the region relying on the outcome of the study by Economic and Social Survey of Asia and the

Pacific (2016). The rate of increase in consumption increased at a higher lending rate compared to an increase in household consumption due to increased exchange rate. The findings imply that in SSA household consumption is positively influenced by the lending rate at an average of 13.4% from the descriptive statistics result (Table 1). If the lending rate average is relatively lower household consumption may be significantly high to enhance mass consumption in the region. In addition, if the exchange rate appreciates import will be cheaper and the region can improve its consumerism. Therefore, government need to ensure the stability of the exchange rate by supporting the development of exportable products.

The findings of this study are similar to the findings of Kumar et al., (2019) on Pakistan. They found that the interest rate and exchange rate have a significant positive impact on consumption in Pakistan. Although Kumar et al., (2019) study is country-specific, the study is also on a developing nation; hence the economic situation in the two studies may exhibit similar characteristics. The findings by this study based on the mean group estimator differ from the work of Oseni (2016) who found that exchange rate volatility and interest rate have a significant adverse effect on consumption in a sample of 19 SSA countries. Based on the generalised method of moments (GMM) estimator. It is pertinent to say that the findings by this study based on the random effects' estimator are similar to that of Oseni (2016), but this study's coefficients elasticities (based on the mean group estimator) used the average of the cross-sectional units and time-variant unobserved factors, in the estimation of the parameter values and this was not considered by the estimator used by Oseni (2016). The mean group approach on the average may be a more representative real-life situation of the linkage between cost of credit, exchange rate and consumption in SSA.

In advanced economies, which is relatively better organised than developing nations, findings on the relationship of the variables of the study suggest that interest rate affects consumption but negatively in USA

(Christensen, 2012) while interest rate does not primarily affect consumption in Germany (Hermann-Josef 1995). A panel study on advanced economies by Bahmani-Oskooee and XI (2015) affirms that exchange rate volatility has negative and positive effects respectively on different advanced countries that are included in the sample in both the short and long-run. However, the estimator used by Bahmani-Oskooee and XI (2015) differs from the one used by this study and the main explanatory variable is the volatility of the exchange rate.

5. Conclusion

The paucity of empirical studies on the linkage between household consumption, lending and exchange rates in many developing countries in Africa is one of the motivation for investigating how lending and exchange rates affected household consumption in SSA. Data were obtained from UN Statistical Division and the IMF database.The study employs the mean group econometric method of analysis for a cross-section of 37 economies in the region. We found that at 5 % level of significance lending rate coefficient (0.228) and exchange rate coefficient (0.031) significantly and positively affected household consumption in SSA. It is evident from our findings that the average household consumption pattern in SSA increases if the coefficients of lending and the exchange rates increase by a per cent. The study concluded that lending and exchange rates significantly effected household consumption positively in SSA.

The policy recommendations arising from the result of the study are as follows;

a) Evidence from this study suggests that consumption increases as cost of consumer credit rises (though a paradox outcome) it is expedient for monetary authorities to make policies that will lead to a reduction in cost of consumer creadits in order to achieve a reasonable increase in consumption in the region. If in spite of high cost of credit, consumption still increased in SSA, at a

reduced lending rate household consumption is likely to increase tremediously.

b) The study also found that increase in the exchange rate parameter due to devaluation also led to increased household consumption. Therefore, government should stabilize exchange rate because continuous devaluation might lead to unaffordable higher prices due to exchange rate pass-through effect on domestic prices.

REFERENCES

Alexander, S. S. (1952). Effects of a Devaluation on a Trade Balance. Staff Papers - *International Monetary Fund, 2(2), 263.* doi:10.2307/3866218.

Ali, S. Yusop, Z., Kaliappan, S. R., & Chin, L. (2020). Dynamic common correlated effects of trade openness, FDI, and institutional performance on environmental quality: evidence from OIC countries. Environmental Science and Pollution Research https://doi.org/10.1007/s11356-020-07768-7

Anderson, T.W., & Hsiao, C. (1982). Formulation and estimation of dynamic model using panel data. *Journal of Econometrics*, 18, 47–82. https://www.sciencedirect.com/

Arapova, E. (2018). Determinants of Household Final Consumption Expenditure in Asian Countries: A Panel Model 1991-2015. *Applied Econometrics and International Development* 18(1), 121-140. aeid1818.pdf (usc.es)

Babangida, J. S Sanusi, A. R., & Yusuf, I. M (2021). Relationship between Real Exchange Rate and Consumption in Nigeria: A Nonlinear Approach. *CBNJournal of Applied Statistics* 12(2), 125-148. https://dc.cbn.gov.ng/

Bernanke, B.S., & Gertler, M. (1995). Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives*. 9, 27-48. https://www.jstor.org

Bahmani-Oskooee, M. & XI, D. (2015). Exchange rate volatility and domestic consumption: a multicountry analysis. *Journal of Post Keynesian Economics* 12(34), 319-330 DOI 10.2753/PKE0160-3477340207.

Bahmani-Oskooee, M., Kutan, A. M., & Xi, D. (2015). Does exchange rate volatility hurt domestic consumption? Evidence from emerging economies. *International Economics, 144*, 53–65. https://doi.org/10.1016/j.inteco.2015.05.002

Blare, JB (1978). *Macroeconomics: Cycle, Growth and Policy in a Monetary Economy*. McMillan, London.

Bunn, P., Le Roux, J., Reinold, K. & Surico, P. (2018). The Consumption Response to Positive and Negative Income Shocks. *Journal of Monetary Economics* 96, 1-15. https://lbsresearch.london.edu/id/

Caselli, F. & Reynaud, J (2019). Do Fiscal Rules Cause Better Fiscal Balances? A New Instrumental Variable Strategy. IMF Working Paper WP/19/49. WPIEA2019049.pdf

Chishti, M. Z., & Azeem, H. S. M., & Mahmood, F., & Sheikh, A. A. (2019). Exchange Rate Volatility and Domestic Consumption: A Comparative Study of Developed, Developing and Emerging Economies. *International Journal of Accounting and Financial Reporting* 9(3), 164-179. https://www.macrothink.org/

Christelis, D., Georgarakos, D., Jappelli, T. Pistaferri, L., & Rooij, N. (2019). Asymmetric Consumption Effects of Transitory Home Shocks. *The Economic Journal* 129(622), 2322-2341. *https://www.dnb.nl/*

Christensen, L. (2012). "How Are Interest Rates Affecting Household Consumption and Savings?" All Graduate Plan B and other Reports. 215. https://digitalcommons.usu.edu/gradreports/215

Chudik, A. and Pesaran, M. H (2013). Common Correlated Effects Estimation of Heterogeneous Dynamic Panel Data Models with Weakly Exogenous Regressors. Federal Reserve Bank of Dallas Globalization and Monetary Policy Institute Working Paper No. 146. http://www.dallasfed.org/assets/documents/institute/wpapers/2013/0146.pdf

Cloyne, J. Ferreira, C. & Surico, P. (2015). *Monetary Policy When Households Have Debt: New Evidence on the Transmission Mechanism*. Retrieved from http://economics.mit.edu/files/12667

Economic and Social Survey of Asia and the Pacific (2016). Nurturing productivity for inclusive growth and sustainable development. United Nations ESCAP

www.unescap.org *› sites › default › files › publications*

Eberhardt, M. (2012). Estimating panel time-series models with heterogeneous slopes *The Stata Journal* 12(1), 61–71. 1536867X1201200105 (sagepub.com)

Eberhardt, M., & Teal, F. (2010). Productivity analysis in global manufacturing production. Discussion Paper 515, Department of Economics, University of Oxford. http://www.economics.ox.ac.uk/research/WP/pdf/paper515.pdf.

Eberhardt, M., & Teal, F. (2011). Econometrics for grumblers: A new look at the literature on cross-country growth empirics. *Journal of Economic Surveys* 25: 109–155. doi: 10.1111/j.1467-6419.2010.00624.x

Ekong, C. N. & Effiong, U. E (2020). Economic Determinants of Household Consumption Expenditures in West Africa: A Case Study of Nigeria and Ghana. *Global Scientific Journals*: 8(9), 385-398. www.globalscientificjournal.com

Esra, A. & Unal, S. (2019). The dynamics of household final consumption: The role of Wealth Channel. *Central Bank Review*, 19, 21-32. https://www.econstor.eu/

Everaert, G. & De Groote, T (2014). Common Correlated Effects Estimation of Dynamic Panels with Cross-Sectional Dependence. *Econometric Reviews*, 35:3, 428-463, DOI: 10.1080/07474938.2014.966635.

Duca-Radu, I., Kenny, G., & Reuter, A. (2020). Inflation expectations, consumption and the lower bound: Micro evidence from a large multi-country survey. *Journal of Monetary Economics*. https://doi.org/10.1016/j.jmoneco.2020.03.005

Duesenberry, J. S. (1949). *Income, Savings, and the Theory of Consumption Behavio*r. Cambridge, Mas. Harvard University Press.

Disyatat, P. (2011). The Bank Lending Channel Revisited *Journal of Money, Credit and Banking*, 43(4), 711-734. https://www.bis.org/

Fadhil, D. M., & Rajab, N. A. (2021). Impact of Interest Rate on Household Consumption in Tanzania. *Journal of Economics, Management and Trade* 27(8), 44-62. *https://repository.uksw.edu/*

Frees, E. W. (1995). Assessing cross-sectional correlation in panel data. *Journal of Econometrics* 69:393–414. https://www.sciencedirect.com/

Friedman, M. (1937). The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of the American Statistical Association* 32: 675-701. https://www.jstor.org/

Friedman, M. (1957). *A Theory of Consumption Function /* ed. By M. Friedman Princeton University Press.

Gohar, R., Chang, B. H., Uche, E, Memon, P. A., & Bhatty, K. (2023). The Asymmetric Effect of Exchange Rate on the Household Consumption Expenditure. *Etikonomi* 22 (1), 31 – 44. https://journal.uinjkt.ac.id

Greene, W. H. (2008). *Econometric Analysis* Pearson Education, Inc. Dorling Kindersley Publishing, Inc.

Hermann-Josef, H. (1996). The Impact of Interest Rates on Private Consumption in Germany (1996). Bundesbank Series 1 Discussion Paper No. 1996,03E, Available at SSRN: https://ssrn.com/abstract=2785779

Iddrisu, A. A., & Alagidede, I. P. (2020). Monetary policy and food inflation in South Africa: A quantile regression analysis. *Food Policy*. https://doi.org/10.1016/j.foodpol.2019.101816

International Monetary Fund (2020). International Financial Statistics Database. data.imf.org

Iyke, B. N. & Ho, S (2019). Consumption and exchange rate uncertainty: Evidence from selected Asian countries. *World Economy* https://doi.org/10.1111/twec.12900

Jappeli, T & Pistaferri, L. (2010). The Consumption Response to income Changes. *Annual Reviews of Economics* 2, 479-506. https://doi.org/10.1146/annurev.economics.050708.14

Kumar, A., Bhutto, N. A., Mangrio, K. A. & Kalhoro M. R. (2019). Impact of external debt and exchange rate volatility on domestic consumption. New evidence from Pakistan. *Cogent Economics & Finance* 7,1568656 https://doi.org/10.1080/23322039.2019.1568656

Keynes, J. M. (1936). The General Theory of Employment, Interest and Money. London: Macmillan.

Logemann, J. (2008). Different Paths to Mass Consumption: Consumer Credit in the United States and West Germany during the 1950s and '60s. *Journal of Social History* Vol. 41(3), 525-559. https://muse.jhu.edu/

Mankiw, N. G. & Campbell, J.Y. (1991). The response of consumption to income: a cross-country investigation. *European Economic Review* 35(4), 723-756. https://www.sciencedirect.com/

Modigliani, F., & Ando, A. (1975). *Tests of the life Cycle Hypothesis of Savings twenty years later* in Michael Parkin ed., Contemporary issues in Economics, Manchester, Manchester P. 2-35. https://www.princeton.edu/

Mankiw, N. G. (1985). Consumer Durables and the Real Interest Rate: *The Review of Economics and Statistics.* 67(3), 353-362. https://www.princeton.edu/

Muellbauer, J & Lattimore, R. (1995). "The Consumption Function: a Theoretical and Empirical Overview", in: *Handbook of Applied Econometrics: Macroeconomics*, H Pesaran and M Wickens (eds), Blackwell Publishers, pp. 221-311.

Oseni, I. O. (2016). Exchange rate volatility and private consumption in Sub-Saharan African countries: A system-GMM dynamic panel analysis *Future Business Journal* 2,103–115. https://www.econstor.eu/

Pesaran, M. H., & Smith, R. P. (1995). Estimating Long-Run Relationships from Dynamic Heterogeneous Panels, *Journal of Econometrics*, 68(1), 79–113. https://www.econ.cam.ac.uk/

Pesaran, M. H. (2006). Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica*, 74(4), 967–1012. doi:10.1111/j.1468-0262.2006. 00692.x

Pesaran, M. H. (2015). Testing Weak Cross-Sectional Dependence in Large Panels *Econometric Reviews*, 34(6–10):1089–1117. DOI: 10.1080/07474938.2014.956623

Taylor, J.B. (1995). The Monetary Transmission Mechanism: An Empirical Framework. *Journal of Economic Perspectives*, 9, 11-26. https://www.aeaweb.org/

Stephens, M. & Unayama, T. (2011). The Consumption Response of Seasonal Income: Evidence from Japanese Public Pension Benefits. *American Economic Journal: Applied Economics* 3(4), 86-118. https://www.aeaweb.org/

Sarafidis, V., Yamagata, T., Robertson, D. (2009). A test of cross section dependence for a linear dynamic panel model with regressors. *Journal of Econometrics* 148:149–161. https://eprints.um.edu.my/

Wilcox, J. A. (1990). Nominal interest rate and real consumption expenditure. Palgrave *Macmillan Journals* 25(4), 31-37. https://assets-eu.researchsquare.com

Varlamova, J. & Larionova, N. (2015). Macroeconomic and Demographic determinants of Household Expenditure in OECD Countries. Procedia Economics and Finance 24, 727-733. Doi/10.1016/S2212-5671(15)00686-3

United Nations Statistics Database (2020). Aggregate National Accounts.

unstats.un.org

EFFECT OF E-BANKING TOOLS ON FRAUD DETECTION IN NIGERIA BANKING INDUSTRY, 2005-2021

****

Eze, O. R.[1]; Ogiji F. O.[2]; Eze, N. G.[3]; Ogbonna, E. U.[4]; Sagbara, B. V.[5], Ibiam, C. I.[6]; Nwogo, J. E.[7] & Nwambeke, G. C.[8]

ABSTRACT

The study investigated the effects of E-banking tools on Fraud Detection in the Nigerian Banking Industry from 2005 to 2021. Specifically, it examined the impact of Automated Teller Machines (ATM) and Internet Banking on fraud detection in Nigeria. The study utilized an Ex-post facto research design and Ordinary Least Square Regression Analysis for hypothesis testing. Annual time series data spanning 16 years were collected from the Central Bank of Nigeria's statistical bulletin and deposit money bank annual publications. The findings indicated that ATM usage had a negative and significant effect on fraud detection in the Nigerian banking industry during the period (-0.379399 and sig. = 0.0011). Conversely, Internet Banking (INTB) had a positive and significant effect on fraud detection in the industry (0.832749 and sig. = 0.0036). This suggests that e-banking tools, such as ATMs and Internet Banking, have a significant impact on fraud detection in Nigerian banks.[1]

The study recommends effective utilization of e-banking tools in the banking industry to enhance fraud detection capabilities.

Keyword: ATM, Fraud, E-banking, Internet Banking, Detection.

[1, 2,3,7-9] *Department of Banking and Finance, Ebonyi State University, Abakaliki, Nigeria*
[4] *Bursary Department, Federal College of Education (T), Rivers State*
[5] *Department of Banking and Finance, Ebonyi State University, Abakaliki, Nigeria*

1.0 Introduction

Over the years, many countries in the world are often exposed to different types of occupational fraud by their employees. These fraud incidents affect a wide range of people from management, employees, auditors, account payables, and investors. Countries that have been battling with fraud incidence are making efforts to prevent it and proactively manage the fraud menace. Preventing fraud is a considerable challenge to organizations as fraudsters continuously discover different methods to commit fraud while the detection of fraud is even more difficult as fraudsters usually attempt to conceal their tracks (Kalana, 2019).

Despite a rather late start, available statistics indicate that E-banking is rapidly gaining ground in Nigeria (Afolabi, 2011). Due to its many possibilities, E-banking constitutes veritable tools for socio-economic development, which makes the legal and regulatory environment for their application in developing countries critical. Among other impacts, E-banking has brought about significant changes in business practices with respect to banking transactions and, to some extent, the buying and selling of goods and services, through the possibilities of the medium to promote trade and commerce through wider access to prospective customers from anywhere on the globe for products and services (Adejoke, 2012).

Fraud, as stated earlier, is not peculiar to the banking industry but cuts across other sectors of the economy. Frauds in banks are not new. In fact, it is as old as the industry itself. But in recent times, the practice has assumed an alarming proportion. Sometimes, the act is carried out by outsiders while in most cases there is a collaborated effort between outsiders and staff to perpetrate this financial crime. Against this background, this study examined the effect of E-banking on fraud detection in Nigeria banking industry using ATM usage, internet banking, and computerized system control as the independent variables while fraud detection was used as the dependent variable.

The expectation of users of Nigeria banking services has changed in line with technological development and here laid the problems evident in the operation of Nigeria banks: Ineffective business strategies requiring

restructuring and reengineering of programs; too much time spent on various banking transactions and unnecessary use of material resources such as paper; frequent system breakdown without provision for an alternative means of attending to customers during the period of breakdown: absence of parallel system arrangement; Inefficiency in payment and transactions processing systems.

Kayode and Joseph (2022) in their study listed the major inhibiting factors to Internet banking adoption in Nigeria such as insecurity, inadequate operational facilities including telecommunications facilities and electricity supply, and made recommendations on how Nigeria banks can narrow the digital divide. Also, the report revealed that Internet banking is being offered at the basic level of interactivity with most of the banks having mainly information sites and providing little Internet transactional services.

2.0 Statement of Problem

The rapid adoption of E-banking in Nigeria, despite its relatively late start, has introduced new dynamics into the banking sector (Afolabi, 2011). E-banking, with its myriad possibilities, has become a critical tool for socio-economic development, transforming business practices in banking transactions and commerce by providing broader access to customers globally (Adejoke, 2012). However, with the advantages of E-banking come significant challenges, particularly in fraud detection.

The core issues involved include:

- Increased Opportunities for Fraud: E-banking platforms, including ATM usage, internet banking, and computerized systems, provide new avenues for fraudsters to exploit.
- Technological Complexity: The sophisticated nature of E-banking technologies makes it difficult for traditional fraud detection methods to be effective.
- Collusion between Insiders and Outsiders: Many fraud incidents involve collaboration between bank staff and external parties, complicating detection efforts.

- Inadequate Security Measures: The existing security infrastructure in many Nigerian banks is not robust enough to handle the advanced methods used by fraudsters.

Past Efforts and Outcomes

Several measures have been implemented in the past to address these challenges:

- Implementation of Basic E-banking Security Protocols: While many banks have adopted basic security measures, these have often proven inadequate against sophisticated fraud techniques.
- Regulatory Interventions: The Central Bank of Nigeria and other regulatory bodies have introduced guidelines to improve security and fraud detection. However, the effectiveness of these regulations has been mixed due to inconsistent enforcement and compliance.
- Adoption of Fraud Detection Software: Banks have invested in advanced fraud detection software, but the high cost and complexity of these systems have limited their widespread adoption.

Despite these efforts, fraud remains a significant issue in the Nigerian banking sector, suggesting that existing measures are insufficient and need to be enhanced.

3.0 Objectives of the Study

The primary objective of this study is to investigate the effects of E-banking tools on fraud detection in the Nigerian banking industry. Specifically, the study aims to:

1. Evaluate the Impact of ATM Usage on Fraud Detection: Assess how the widespread use of ATMs influences the ability of banks to detect fraudulent activities.
2. Analyze the Role of Internet Banking in Fraud Detection: Examine how internet banking platforms contribute to or mitigate fraud incidents.

3. Assess the Effectiveness of Computerized System Controls: Determine how well computerized systems control and monitor fraudulent activities.
4. Identify Gaps in Current Fraud Detection Methods: Highlight weaknesses in existing fraud detection strategies and propose improvements.

By addressing these objectives, the study seeks to provide comprehensive insights into how E-banking tools affect fraud detection and to recommend strategies for enhancing the security and integrity of the Nigerian banking system.

4.0 Literature/Theoretical Review

Nations all over the world have acknowledged the advanced prospects and challenges of the emerging information age characterized by E-banking. E-banking is a product designed for the purpose of online banking that enables you to have easy and safe access to your bank account. E-banking is a safe, fast, easy, and efficient electronic service that enables you to access your bank account and carry out online banking services 24 hours a day, 7 days a week. It involves the use of computers and telecommunications to enable banking transactions to be done by telephone or computer rather than through human interaction. Its features include electronic funds transfer for retail purchases, automatic teller machines (ATMs), and automatic payroll deposits and bill payments (Nwankwo, Idachaba, and Eze, 2022). Ahmad (2008) opined that these technologies are driving national development efforts worldwide, and a number of countries, both in the developing and developed world, are exploring ways of facilitating their development process through the deployment and exploitation of ICT within their economies and societies.

Types of Electronic Transaction Systems in Nigeria

Various types of e-payment systems exist in Nigeria and have formed the e-banking product. The most prominent are discussed below:

Automated Teller Machine (ATM): An Automated Teller Machine (ATM) is a computerized telecommunications device that provides

customers of a financial institution with access to financial transactions in a public space without the need for a human clerk or bank teller. On most modern ATMs, the customer is identified by inserting a plastic ATM card with a magnetic stripe or a plastic smart card with a chip that contains a unique card number and some security information, such as an expiration date. Security is provided by the customer entering a personal identification number (PIN).

Internet/Web Payment: The internet is an innovative form of information technology, yet most commercial websites function as well-defined information systems. Internet banking, compared to the traditional banking system, heavily involves no-human interactions between customers and online bank information systems. This means that the satisfactory delivery of service not only relies on the traditional service quality identified in existing literature but also on a reliable online system to provide a comfortable end-user computing environment. This, according to Popoola (2010), has been a result of the exodus of customers to the New Generation banks that are technology-inclined.

Fraud Detection in Banks: Fraud detection is central to fraud prevention, as when fraudsters know their fraudulent acts will be detected with ease, they will think twice before acting. It is rightly recognized that "the best deterrent is the certainty of detection" (Nwankwo, 1991). On the part of management, these can be part of the general system of controls or in the form of a special internal audit or both.

Empirical Review

Over the years, many countries around the world have faced various types of occupational fraud by employees. These fraudulent activities impact a wide range of stakeholders, including management, employees, auditors, account payables, and investors. Countries struggling with fraud incidents are making concerted efforts to prevent it and proactively manage this pervasive issue. Preventing fraud is a considerable challenge for organizations because fraudsters continuously discover new methods to commit fraud, and detecting fraud is even more difficult as they often attempt to conceal their tracks (Kalana, 2019).

Nwankwo, Idachaba, and Eze (2022) examined the Effects of e-Transactions on the Profitability of Commercial Banks in Nigeria. E-cheque, ATM, POS, Mobile Money Transfer (MMT), and Online Money Payment (WEB) are proxies for E-banking payments, while Return on Equity (RoE) is used as a proxy for commercial banks' profitability. An ex-post-facto research design is adopted, covering the period 2010-2020. Diagnostic tests are conducted, and an analysis of an Auto Regressive Distributed Lag (ARDL) estimated using the Error Correction Model (ECM) approach. The result of the analysis indicates that current values of E-CHEQUE, ATM, MMT, POS, and WEB are statistically significant at less than 0.05. While E-cheque is insignificant to the profitability of banks in Nigeria. This study thus rejects the null hypotheses and concludes that with the coefficient of determination (R2) and adjusted R-Square of the model, about 83% influence on bank profitability in Nigeria can be influenced by these variables of study. It also means that the combined effect of the e-banking proxies in this study is statistically significant in explaining the profitability of banks in Nigeria. The recommendations are that Banks should invest in all the channels of electronic payment to ensure that the economy, just like a developed economy, fully and seamlessly operates a cashless economy. It is obvious that the fundamental of every developing economy is to make the banking sector stable and sustainable enough to drive its economy.

Enwere (2022) examined bank fraud, its causes, and types of bank fraud. The rate at which Information and Communication Technology (ICT) is being applied to perpetrate crime in Nigeria is becoming worrisome. Different methods of defrauding banks were revealed in this paper. Also, computer and ICT have made bank crime easy. Good networking of computer systems, employment of professionals who specialize in fraud detection, and regular rotation of staff and duties were recommended in this paper to curb banking fraud in Nigeria.

Mark (2021) evaluates the impact of information and communication technology on the accounting procedure and system (APS) in corporate organizations. The study reviews many resources and related literature about the impact of information technology on the accounting procedure

to determine the main effects, enhance the development of these technologies to strengthen the APS, and reduce the errors in this system. The study concludes that information technology innovation contributed to the development of corporate accounting systems, improved business performance, and helped the emergence of cloud accounting. One of the most important downsides of employing information technologies in APSs is the lack of standardized technologies used in all systems, as companies are usually selective in choosing technologies that suit their activities, and this weakens the transparency of the outputs of APSs. Hence, now it is the time to think beyond the curtains and ensure proper implementation and maintenance of information and communication technology.

Ismail (2020) empirically investigated the effect of information communication technology systems on fraud prevention in Kwara State Public Sector. The specific objectives are to: (i) assess the effect of interactive data extractive analysis (IDEA) usage on fraud prevention in Kwara State Public Sector; (ii) examine the effect of continuous online auditing (COA) on fraud prevention in Kwara State Public Sector; (iii) and ascertain the extent to which computerized system control (CSC) affects fraud prevention in Kwara State Public Sector. Primary data were collected through copies of administered questionnaires, which were analyzed using Ordered Logic-Regression Analysis (OL-RA). Results of the study were; that IDEA usage had a significant positive relationship with fraud prevention in Kwara State Public Sector at the 0.5% level of significance (p-value of 0.000); that COA had a significant positive effect on fraud prevention in Kwara State Public Sector at the 0.05% level of significance and that CSC is positively significantly related at the 0.05% level to the prevention of fraud in Kwara State Public Sector. In line with these findings, the study concluded that IDEA usage, COA, and CSC had a strong positive significant relationship with fraud prevention in Kwara State Public Sector. The study recommended that Ministries should manage interactive data extractive analysis usage efficiently and effectively to improve fraud prevention; improve on continuous online auditing to enhance the integration of audit skills, reduce routine tasks to provide more time for creative and audit analysis, which will, in turn,

improve fraud prevention. Furthermore, ministries should constantly organize seminars, workshops, and training for their staff on computerized system control to improve their efficiency and also allow them to participate in decision-making, which will, in turn, improve fraud prevention in the Kwara State public sector.

Cecilia (2019) investigates the relationship between ICT utilization and fraud losses in commercial banks in Kenya. The period under study was 2008-2012. ICT utilization in this case was represented by the monthly values transacted through EFT, RTGS, and ATM. The control factor of staff costs was used to represent motivations for fraud. Secondary data was used for this study and was collected from CBK reports, BFIU reports, and audited financial statements for all the 43 registered commercial banks in Kenya. SPSS version 16 was used to analyze data. Data were analyzed through regression analysis and represented in tables. The findings established that the commercial banks in Kenya incurred average fraud costs of Kshs. 90.9 million between the years 2008 and 2012. The average values transacted through ATM, RTGS, and EFT were Kshs 9595.09 million, Kshs 1,501,146 million, Kshs 262,300 million, while the average staff costs were Kshs 4,334.15 million, respectively, within the same period. The levels of ICT utilization generally increased, EFT values increased from 214 billion in 2008 to 416 billion in 2012. Fraud costs increased rapidly from 64 million monthly in 2008 to 417 million in 2012.

Akinbowale (2018) examined the impact of information communication technology (ICT) on forensic accounting practice. A survey was designed and carried out using a questionnaire, and the data obtained were analyzed using Kolmogorov-Smirnov (K-S) test, percentage analysis, and reliability statistics. The outcome of the analysis revealed that information technology (IT)-based forensic accounting has a significant agreement with the speed of detecting fraud with other financial crimes in the process of forensic investigation. It was concluded that IT-based forensic accounting would minimize time spent while performing forensic investigation and also bring about accurate evidence regarding financial reporting and other suspected criminal case investigations.

Babatunde and Salawudeen (2017) examined the impact of electronic banking in the Nigerian banking industry and financial institutions. The paper uses both primary and secondary data to elicit information from the respondents. The primary data were collected through the use of a questionnaire, while the secondary data were obtained from the publications of the Central Bank of Nigeria Electronic Banking Guideline, Annual Reports of the CBN, and Access Bank Plc. The paper employs both descriptive and inferential statistics to analyze the data. In addition, simple frequency counts, percentages, and the Chi-square were used in the data analysis. Findings show that the electronic banking system has made banking transactions easier. The paper concludes that the adoption of electronic banking has enhanced the bank's efficiency, making it more productive and effective. The paper, therefore, recommends that the Nigerian banking sector must be focused in terms of their needs and using the right technology to achieve goals, rather than acquiring technology of internet banking because other banks have it.

Theoretical Framework

The theoretical framework adopted in this study is the Diffusion of Innovations (DOI) theory developed by Rogers in 1995. The three assumptions of the theory are that it should be diffused and adopted by all members of a social system, it should be diffused more rapidly, and it should be neither reinvented nor rejected. It is essentially an idea, practice, or object that is perceived to be new by a person or adopting entity. Innovation is transmitted through diffusion and adoption. Diffusion entails communicating or spreading the news of the innovation to the group for which it is intended. Adoption, however, is the commitment to and continued use of the innovation (Oluwafemi, 2011).

5.0 Methodology

This study adopted an ex-post facto research design. According to Nworgu (1991) cited in Uzoagulu (1998), a research design is a plan or blueprint that specifies how data relating to a given problem should be collected and analyzed. This research design shall be used considering the fact that the researcher used time series data spanning from 2000 to 2021. This design, however, relates to setting up a particular type of study in

which one has no control over the allocation of the treatments or other factors that were studied.

This research adopts a secondary source of data. All data will be obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, Nigerian Stock Exchange Fact Book, Banks' Annual Reports, and Nigeria Deposit Insurance Corporation (NDIC) Annual Reports.

Multiple regression, which is an extension of simple linear regression, was adopted in this study with the help of the ARDL ECM model. It is used when we want to predict the value of a variable based on the value of two or more other variables. The variable we predict is called the dependent variable (or sometimes the outcome, target, or criterion variable).
An Autoregressive Distributed Lag Model is considered as:
(ARDL(1,1) model: $yt = \mu + \alpha 1 yt\text{-}1 + \beta 0 xt + \beta 1 xt\text{-}1 + ut$
Where yt and xt are stationary variables, and ut is white noise.
The ARDL Model equation is the same as the conventional ARDL model, including a specific restriction. The restriction is that the coefficient on the x(t-1) variable is equal to 0. The ARDL model is:
$Y_t = \beta_0 + \beta_1 X_{t-1} + \beta_2 X_t + \beta_3 X_{t-1} + \mu_t$ …… (1)
Using the ARDL model:

$$\Delta y_t = \alpha_{1,0} + \sum_{i=1}^{p} \alpha_{1,i} \Delta y_{t-i} + \sum_{j=0}^{q} \beta_{1,j} \Delta x_{t-j} + \sum_{k=0}^{r} \gamma_{1,k} \Delta er_{t-k} + \eta_{1,t}$$

where Δ represents the first difference of the variables, p and n are the lag lengths and the et is a scalar mean error term.
To achieve the specific objectives of our study, we modified the equation as follow:
BFD=F (INTB, ATM) ……(1)
Where;
BFD is the fraud detected at current period in Nigeria;

INTB is the sum of transactions done in internet in the banking sector in Nigeria

ATM is the volume of automated teller machine use in Nigeria at current period;

The model can also be transformed as follow:

$BFD = \beta_0 + \beta_1 ATM + \beta_2 INTBT + \mu$…….. (2)

Where; β_0 to $\beta 2$ are the parameter of the coefficient and μ the error term

.

Data Analysis

Model Stability Test

Stability of the estimated parameters is tested by applying the cumulative sum of recursive residuals (CUSUM) and of squared recursive residuals (CUSUMSQ).Graphical representations of CUSUM and CUSUM square are shown in figure 11 and 12 for the long-run OLS model. According to Bahmani and Oskooee, (2004) the null hypothesis (i.e. that the regression equation is correctly specified) cannot be rejected if the plot of these statistics remains within the critical bounds of the 5% significance level.

1. **Cumulative Sum Test**

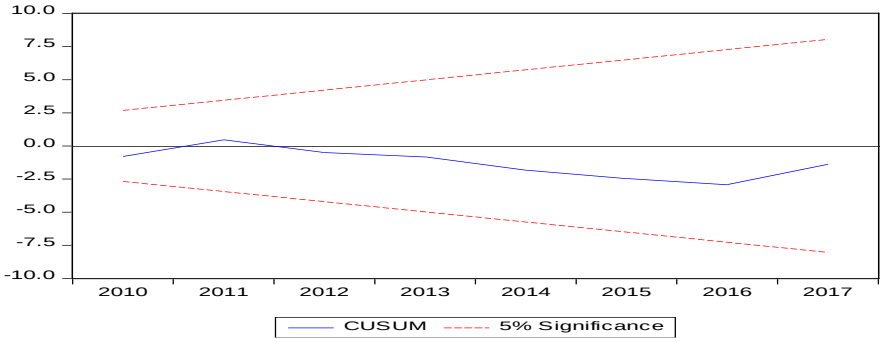

Figure 1: CUSUM Curve

2. Cumulative Sum of Squares Test

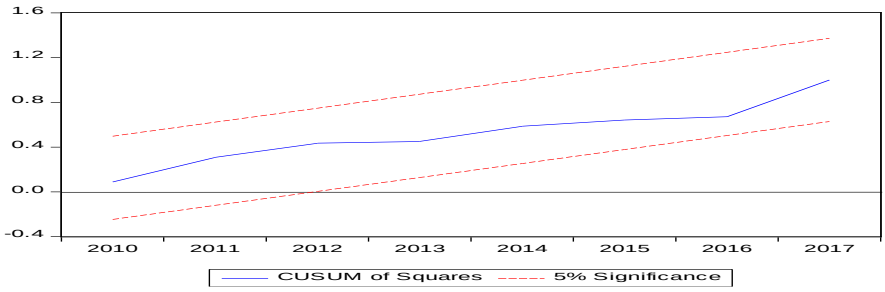

Figure 2: CUSUM of Squares

As it is clear from Fig. 1 and 2, the plots of both the CUSUM and CUSUM square are within the boundaries, confirming the stability of the long-run coefficients of regressors. Movement outside the critical 5% significance lines of the CUSUM test suggests parameter or variance instability. From the two graphs above, the cumulative sum of squares and cumulative sum are generally within the 5% significance lines, suggesting that the residual variances are stable.

Error Correction Model (ECM) Estimates for Model 1

In this stage, an error correction model for the selected ARDL Model is estimated. Table 7 below presents the results of the estimated ARDL ECM corresponding to the long-run estimates for Model 1 selected using Schwarz Bayesian Criterion. The estimated ECM has two parts. The first part contains the estimated coefficients of short-run dynamics, and the second part consists of the estimates of the error correction term (ECT) that measures the speed of adjustment whereby short-run dynamics converge to the long-run equilibrium path in the model.

The Error Correction Model (ECM) result shows how the system adjusts to the long-run equilibrium implied by the co-integrating equation 3. A crucial question concerning the ECM is about the optimal lag for the right-hand-side variables. Hendry's (1987) methodology of "general-to-specific" was employed via a stepwise regression procedure (through the elimination of those variables and their lags that are highly not significant), before finally arriving at an interpretable model. The

elimination process was carried out until the coefficient of the error correction term ECT(-1) has the expected negative sign, less than unity, and is highly significant at the 1.0 percent level of significance. Accordingly, this led to an initial estimation of an ECM with three lagged differences of the explanatory variables, a constant term, and an error correction term lagged one (ECMst-1). The dimensions of the parameter space were then reduced to a parsimonious ECT specification by using omitted and redundant variable tests to exclude the statistically insignificant lags.

The main purpose of the error correction model is to indicate the speed of adjustment from the short run to the long-run equilibrium state. A co-integration relationship has been established among the variables, and then the Error Correction Mechanism was used for this exercise to determine the behavior of Information and Communication Technology (ICT) on Bank Fraud Detection (BFD). This is because the greater the coefficient of the parameter, the higher the speed of adjustment of the model from the short run to the long run equilibrium. As noted, the ECM is meant to tie the short-run dynamics of the co-integrating equations to their long-run static dispositions.

Table 1: ARDL ECM Result

ARDL Error Correction Regression
Dependent Variable: D(BFD)
Selected Model: ARDL(4, 4, 4, 3, 4)
Case 1: No Constant and No Trend
Sample: 2005 2021
Included observations: 17

ECM Regression
Case 1: No Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BFD(-1))	-0.395531	0.228526	-1.730793	0.1217
D(BFD(-2))	-0.387880	0.133406	-2.907521	0.0197
D(BFD(-3))	-0.536512	0.179379	-2.990946	0.0173

D(ATM)	0.035499	0.060232	0.589365	0.5719
D(ATM (-1))	-0.379399	0.076059	-4.988226	0.0011
D(ATM (-2))	-0.473085	0.092312	-5.124876	0.0009
D(ATM (-3))	-0.302700	0.087660	-3.453124	0.0087
D(INTB)	0.095630	0.139082	0.687579	0.5112
D(INTB (-1))	0.832749	0.205026	4.061672	0.0036
D(INTB (-2))	0.489667	0.206253	2.374110	0.0450
D(INTB (-3))	0.210432	0.077990	2.698203	0.0271
CointEq(-1)*	-0.284409	0.058774	-4.839063	0.0013

R-squared	0.932464	Mean dependent var	0.308824
Adjusted R-squared	0.814275	S.D. dependent var	3.066866
S.E. of regression	1.321690	Akaike info criterion	3.648364
Sum squared resid	20.96238	Schwarz criterion	4.636009
Log likelihood	-40.02218	Hannan-Quinn criter.	3.985179
Durbin-Watson stat	2.506320		

* p-value incompatible with t-Bounds distribution.
Levels Equation
Case 1: No Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ATM	1.314723	0.664469	2.978607	0.0032
INTB	-1.192529	0.763633	-3.561652	0.0370

EC = BFD - (1.3147*ATM -1.1925*INTB)

Source: **Extracted from EViews 10 Output 2022**

As expected, the error correction term (EC) term, represented as CointEq(-1), is negative with an associated coefficient estimate of -0.284409. This implies that approximately 28.44% of any movements into disequilibrium are corrected within one period. Moreover, with a very large t-statistic of -4.839063, we can conclude that the coefficient is highly significant. The short-run coefficient estimates show the dynamic adjustment of all variables. The short-run coefficients for ATM and INTB have a significant effect on BFD in lags 1, 2, and 3; CSC also has a significant effect on BFD in lag 1. In summary, the short-run coefficients for ATM and INTB are statistically significant at the 5% level. The

coefficient of the error correction term ecm (-1) estimated at -0.284409 is highly significant, indicating that bank fraud detection, automated teller machine, and internet banking are cointegrated. The estimated value of the coefficient indicates that about 28.44% of the disequilibrium in bank fraud detection is offset by the short-run adjustment in the same quarter.

Furthermore, the parsimonious model is free of serial correlation, as indicated by the Durbin-Watson statistic of 2.51. The coefficient of determination (R-square), used to measure the goodness of fit of the estimated model, indicates that the model is reasonably fit for prediction, with 93.25% of the change in BFD being explained by ATM and INTB collectively, while 6.75% of unaccounted variations are captured by the white noise error term. It shows that ATM and INTB have a strong and significant effect on BFD in Nigeria.

Table 1 above indicates the long-run equilibrium and short-run dynamics of Automated Teller Machine Usage on Bank Fraud Detection. The long-run coefficients show that in the long run, the coefficient of automated teller machine (ATM) lag one has a significant and negative effect on bank fraud detection (BFD) [sig. = 0.0011], and a one percentage increase in automated teller machine leads to a 0.001% decrease in bank fraud detection. The short-run dynamics of automated teller machine on bank fraud detection in Nigeria show that automated teller machine has a significant and positive effect on bank fraud detection in Nigeria (BFD) [sig. = 0.0032], and a one percentage increase in automated teller machine leads to a 1.31 increase in the agricultural sector's contribution to GDP. This indicates that automated teller machine usage reduces the level of bank fraud detection in Nigeria in the long run and increases it in the short run. The increase observed in the short run indicates that automated teller machine usage is a good tool in the banking industry for fraud detection.

Table 1 above also indicates the long-run equilibrium and short-run dynamics of internet banking on bank fraud detection (BFD) in Nigeria. The long and short-run coefficients show that the coefficient of internet banking (INTB) lag one has a significant effect on bank fraud detection (BFD) [sig. = 0.0066 and 0.0436], and a one percentage increase in

internet banking (INTB) leads to a 70.36% increase in bank fraud detection (BFD). The short-run dynamics of internet banking (INTB) on bank fraud detection (BFD) show that internet banking (INTB) has a significant and negative effect on bank fraud detection (BFD) [sig. = 0.0436], and a one percentage increase in internet banking (INTB) leads to an 82.27% decrease in bank fraud detection (BFD). This may be a result of any changes in internet banking having an influence on bank fraud detection after the year the change is made. For bank fraud detection, internet banking (INTB) has a negative and significant effect on bank fraud detection (BFD) in the short run, thus rejecting the null hypothesis and concluding that there is a significant effect of internet banking transactions on fraud detection in the Nigerian banking industry. The level of internet banking (INTB) on bank fraud detection (BFD) in Nigeria has been consistent following the coefficient of 0.832749 and P-value of 0.0036. In this case, the null hypothesis was rejected, while the alternative hypothesis was accepted, concluding that there is a significant and positive effect of internet banking on bank fraud detection (BFD) in Nigeria.

6.0 Conclusion and Recommendation

Conclusion

This study contributes to the literature on the effect of E-banking on fraud detection in the Nigerian banking industry by using the actual functioning types and indicators of E-banking in banking industry data to examine fraud detection in the banking industry. This is because fraud detection in the Nigerian banking industry accounts for a significant share of positioning the banking industry in developed and developing countries like Nigeria. The banking industry, which is the backbone of every economy, is confronted with various challenges such as globalization, deregulation, competition, and fraud. The usage of E-banking can lead to lower costs, but the effect on fraud detection in the banking industry remains inconclusive, owing to the possibility of E-banking effects that arise as a result of consistent high demand for skilled workforce, issues of increasing demand to meet customers' expectations for customer service delivery, trustworthiness of the information system, and competition in

financial services. However, from the discussion while reviewing the literature, many researchers found E-banking to be beneficial for the delivery of customer service and fraud detection among banks in Nigeria. We, therefore, conclude that there is a significant effect of E-banking variables such as ATMs usage and internet banking on fraud detection among Nigerian banks.

Recommendations

Based on our findings and conclusions from our study, the following recommendations were made and they include:

i. Since ATM usage has a positive and significant effect on fraud detection in Nigeria banking industry, there is need for government to increase the level of ATM usage as it is one of the easy ways to detect level of fraud in Nigerian banking industry.

ii. Since there is presence of positive and significant effect of internet banking (INTB) on fraud detection in Nigeria banking industry, government should also increase the level of internet banking so as to increase the level of fraud detect in Nigerian banking industry.

REFERENCES

Adagunodo, A. D. (2010). The effect of information and communication Technology on the growth of banking industry in Nigeria. *Journal of Finance and Strategic Development.* 2(12):2-13.

Adedokun .T.,Idowu A.and Taiwo O. (2013) Evaluation of the Effect of Monitoring and Control Activities on Fraud Detection in Selected Nigerian Commercial Banks. *Research Journal of Finance and Accounting.*4(6):11-20

Adejoke O. O. (2012). The ICT Revolution and Commercial Sectors in Nigeria: Impacts and Legal Interventions. *British Journal of Arts and Social Sciences,* 5(2):3-9.

Adewoye, J. O (2013) Impact of Mobile Banking on Service Delivery in the Nigerian Commercial Banks. *International Review of Management and Business Research.*2(2): 12-22

Adewunni, W. (2013) Fraud in the Nigerian banking sector A challenge to internal Auditor, *Bayero International Journal Accounting Research, 3(4): 12-22*

Afolabi, W. E. (2011). The role of information and communication technology on management function and its structure in Nigeria. *Nigerian Journal of Investment and Finance,*12(2):2-34.

Agwu, M.E, Atuma. O, Aigbiremolen O.M. and Iyola O. (2014). The Impact of Information Communication Technologies in the Strategic Management of Financial Institutions. *International Review of Management and Business Research Journal* 3(3): 12-23

Ahemad, A. D. (2008). The effect of information and communication Technology on the growth of banking industry in Nigeria. *Journal of Finance and Strategic Development.* 2(12):2-3.

Ahmad, A. I. (2008). "The affordances of actor network theory in ICT for development research". *Information Technology and People, 23(4): 352-374.*

Akinbowale O. E. (2018). Information and Communication Technology and Forensic Accounting in Nigeria. *International Journal of Business and Financial Management research, 6:1-7*

Akinlolu A. (2014). Information and Communication Technology (ICT) in Banking Operations in Nigeria – An Evaluation of Recent Experiences. A Research project subject submitted In Partial Fulfillment of the Requirements For The Award Of The Degree in Master of Business Administration, Obafemi Awolowo University, Ile-Ife.

Alawode, T. U. and Ademola, O. K. (2011). Effect of ICT on banks performances in Nigeria. *American Journal of Statistics and Finance.,*12(2):12-24.

Andy A. (2016). Strategies for combating fraud and theft as varieties of corruption in Nigeria. *Bayero International Journal of Accounting Research 1(3): 23-30*

Ayo, I. and Ukpere, O. I. (2010). Are Nigerian SMEs effectively utilizing ICT? *International Journal of Business and Management, 6 (6): 208 – 210.*

Babatunde, O. and Salamudeen, E. (2017). Electronic Payment System in Nigeria: Implementation, Constraints and Solutions. *Journal of Management and Society.1 (2): 16-21.*

Bates M., Manuel S. and Oppenheim C. (2007). Models of Early Adoption of ICT Innovations in Higher Education. *Ariadne Issue 50*:22-24.

Berger, A. N. (2003):The Economic Effects of Technological Progress: Evidence from the Banking Industry, *Journal of Money, Credit, Banking*, 35(2) 141 –176.

CBN (2013). Annual report and Financial Statements for the year end. *CBN*, 19:59.

Cecelia, A. T., (2019). Internal Control System on Fraud: Nigeria Experience. *Journal of Accounting and Finance, 13(5): 137 – 148*

Chandler, D., Daniel, E. I., Munday, S. F., Rod, H. J. and Laugust, R. (2012). Examining ICT in a developing country like Nigeria. Journal of Information Technology, 3(5): 12-20

Chang, Y. T. (2003). Dynamics of Banking Technology Adoption: An Application to Internet Banking, Department of Economics, *Workshop Presentation, University of Warwick, Coventry, UK.*

Christopher, G. C., Mike, L. Visit and Amy, W. (2006). A Logit Analysis of Electronic Banking in New Zealand, *International Journal of Bank Market*, 360-383.

Denning, P. (2004). Building a culture of innovation. *Ubiquity*, 5(8),22-25

Divya, S. and Padhmanabhan, V.(2008,). A Study on Customer Perception towards Internet Banking: Identifying Major Contributing Factors. *The Journal of Nepalese Business Studies*, (1):101-111.

Dorminey, E. D. (2011). "Understanding the dynamic process of emerging ICT adoption in Nigerian service SMEs", Proceeding of the 16th Annual Conference 2011 UK Academy for Information Systems, Oxford, April.

Dougthy, L.K.(1992). Econometrics Models to External Debt and Capital Flight: A Case study of Angola. *ARC Research Paper 9,LLuanda.*

Dube, J. and Chitura, K. (2009). The Impact of Information and Communication Technology on Internal Auditors' Independence: A PEST Analysis of Nigeria. *Journal of Scientific Research & Reports*, 3(13): 7-15

Echezona, C. D., Moguluwa, S. C. and Christian, C. O. (2022). The Effects of Information and Communication Technology in Fraud Reduction in Nigerian Maritime Services. *Global Scientific Journals, 10(7): 958-974*

Ehikhamenor F.(2003).Information Technology in Nigerian banks: the limits of Expectations. *Information Technology for Development*,10:13 – 24.

Ekwueme, C.M, Egbunike, P. A and Amara O.(2012) An Empirical Assessment of The Operational Efficiency of Electronic Banking: Evidence of Nigerian Banks. *Review of Public Administration and Management* 1(2): 1-9.

Enwere, A. (2022). Implication of Information and Communications Technology on Banking Fraud in Nigeria. *International Journal of Business and Economic Research, 6(6): 26-34*

Filipe, B. (2017). Effect of Internal Control on Fraud Detection and Prevention in District Treasuries of Kakamega County. *International Journal of Business and Management Invention*, 4(1): 47-57.

Gallup Consulting (2008). Using Technology to Engage Retail Banking Customer. Working paper, 27.

Gbegi, M. and Adebisi, S. (2015). Detecting Fraud in the Organization: An Internal Audit Perspective. *Journal of Forensic & Investigative Accounting*, 3(1): 195-233.

Gideon A. M. (2016) The Effect of Information and Communications Technology on Financial Performance of Rural Banks in Ghana. A research thesis submitted to the department of Marketing & Corporate Strategy, School of Business, Kwame Nkrumah University of Science and Technology, in partial fulfillment of the requirements for the degree of Master of Business Administration.

Goi, C. L. (2005). E-banking in Malaysia: Opportunities and Challenges. *Journal of Internet Banking and Commerce,10(3):3-9.*

Grainger-Smith, G. and Oppenheim, H. (1994). "Factors affecting emerging ICT adoption in SMEs: an actor network theory analysis". *Greener Journal of Business and Management Studies, 7(3): 030-042.*

Gupta, J.J. (2008) Research methodology in behavioral sciences Apani publications Kaduna, Nigeria.

Harold, B. and Jeff, L. (2011).Don't Let Technology Pass You By.*ABA Banking Journal*,3 (1):2-8.

Ibrahim, H., Yusuf, A and Aishatu, B. B. (2021). Effect of Information and Communication on Fraud Prevention and Detection in Deposit Money Banks in Nigeria. *UMYU Journal of Accounting and Finance Research, 1(2): 21-34*

Idowu, E. T. (2010). The role of information and communication technology in the profit and cost efficiency improvements of the banking sector. *International Journal of Finance,12(1):1-15.*

Imhonopi, D., and Urim, U. M. (2013). ICTs and the digitization of the banking industry in Nigeria: A sociological appraisal. *A panoply of readings in social sciences: Lessons for and from Nigeria.* Pp. 307-324.

Ismail, S. D. (2020). Effect of Information and Communication Technology system on Fraud Prevention in Kwara State Public Sector. *International journal of Finance and Economics, 5(2): 1-12*

James, O. (2014). The Impact of Information and Communication Technology on Internal Control's Prevention and Detection of Fraud within the financial sector of a developing country like Nigeria. *International Journal of Finance,13(1):1-9.*

James, O. B. (2020) The Impact of Information and Communications Technology on Internal Control Prevention and Detection of fraud in Nigeria. *Journal of Business and Economics, 7(8): 25-35*

Jennifer, E. C. (2019). The role of Information and Communications Technology in fraud detection in Nigeria banking industry. *International Journal of Finance and Accounting, 3(2): 1-10*

Kalana, G. E. (2019). Effect of Information Communication Technology on Forensic Accounting in Nigeria. *International Journal of Business and Financial Management Research, 6(1): 8-20.*

Kamel, A (2005). Information Technology, Bank Automation, and Attitude of Workers in Nigerian Banks. *Journal of Social Sciences, Kamla-Raj Enterprises*, 2(6): 1-10

Karjaluoto, H. (2010). Electronic Banking in Finland: Consumer Beliefs and Reactions to a New Delivery Channel. *Journal of Financial Services Marketing, 6(4): 346–361.*

Karjaluoto, H., Mattila, M. and Pento, T. (2010). Electronic Banking in Finland: Consumer Beliefs and Reactions to a New Delivery Channel, *Journal of Financial Services Marketing, 6(4): 346–361.*

Kayode, N. and Joseph, M. (2012) Factors influencing the adoption of internet banking in Nigeria. *International Journal of Business and Management* 6: 143-160.

Kehinde A. A., Felicia O. O., Joseph N. T. (2016). Fraud Prevention and Internal Control in the Nigerian Banking System. *International Journal of Economics and Financial Issues, 6(3), 1172-1179.*

Lembi, M. N. (2017) "Effect of Internal Control on Fraud Prevention of The Listed Manufacturing Industries in Nigeria". *International Journal of Business and Management, 12(2), 1-38.*

Mahdi, M. and Mehrdad, N. (2010). The Impact of Information Technology on Modern Accounting Systems With reference to Pune Region. *International Journal of Research in IT and Management (IJRIM), 6 (8): 87-94*

Maiyaki, A. E. and Mokhtar, W. Y. (2010). Effects of availability of electronic banking facilities among other factors. *Journal of Trade and Finance,* 23(2):12-29.

Majabi, .O.V.(2015). The effect of information and communication technology on the banking services in Nigeria. *Journal of Finance and Statistic,*2(23):2-4.

Makori R.G., Nyagol M.and Ajowi J.O (2016) Influence of Internal Control Systems on Fraud Risk Management among Commercial Banks in Kisii Town, Kenya. *IOSR Journal of Business and Management (IOSR-JBM)*18(4)28-34

Mark, J. L. (2021). Impact of Information and Communication Technology on Accounting Procedure and Systems in Corporate Organizations. *2nd Departmental Seminar Series with the Theme – History of Accounting Thoughts: A Methodological Approach, 34-40.*

Mohammed, A. O. (2010). ICT and gender-specific challenges faced by female entrepreneurs in Nigeria. *International Journal of Business and Social Sciences, 6(3), 97-105.*

Mohammed, S. K.; Siba, S. M. and Sreekumar, S. (2009). Quality Evaluation in Internet Banking: An Empirical Study in India. *International .Journal of Indian Culture and Business Management,* 2(1):2-*9.*

Moorthy. K. M., Seetharaman A., Mohamed, Z., Gofalan, M. and San, L. H. (2011). The impact of information technology on internal auditing. *African Journal of Business Management*, 5(9): 3523-3539.

Mugo, K. (2013) The impact of information and communication technology on the performance of employees in the private and public sector. *Journal of Web Business and Economic 2(3): 21-26.*

Ngalyuka, C. (2013). The relationship between ICT utilization and fraud losses in Commercial bank in Kenya. A Research Project Submitted In Partial Fulfillment of the Requirements for the Award of the Degree in Master Of Business Administration, University Of Nairobi.

Nwankwo, O., Idachaba, O. I. and Eze, O. R. (2022). Effects of E-Transactions on the Profitability of Commercial Banks in Nigeria. *Journal of Banking, **10(2): 87-114**.*

Nworgu, B.G. (1991). Educational Research: Basic Issues & Methodology. Ibadan: *Wisdom Publishers (Chapter 7).*

Obasan K. A.(2011). Information and Communication Technology and Banks Profitability in Nigeria. *Australian Journal of Business and Management Research* 1(4)102-107

Ogunyomi, O. O. and Obi, E.(2016)Information and Communication Technology Investment and Firm Productivity: Evidence from the Nigerian Banking Industry. *Research Journal of Finance and Accounting*7(8): 1-12

Oladejo, M. (2016). E-payments adoption and Profitability performance of Deposits Money Banks in Nigeria. *International Journal of Information Technology,4:1-9*

Olakunle, D. (2016). Relationship between Fraudulent Banking Operation and Information and Communication Technology: A survey of criminality in the Nigerian Banking Sectors. *Journal of Web Business and Economic 2(3): 10- 20.*

Olatokun W. M. and Igbinedion L. J. (2009). The adoption of Automatic Teller Machines in Nigeria: an application of the theory of Diffusion of Innovation, *Issues in Informing Science and Information Technology,* 6:373 -393.

Oluwafemi, E. S. (2011). ICT's, Service Delivery and Operational Performance in Nigerian Banks: a Survey of Empirical Research. *An International Multidisciplinary Journal, Ethiopia,*5 (4): 44-59.

Osaze, B. E(2000). The Nigerian Capital Market in the African and Global Financial System. Benin City: *Bofic Consulting Group Ltd.8-9.*

Popoola, A. A. (2010) Impact of Electronic Banking on Customer Services in Lagos, Nigeria Ife. *Journal of Economics and Finance. Department of Economics, O.A.U, Ile-Ife, Nigeria*, 5(1&2): 32-39

Taiwo, J. N. and Agwu, M. E. (2017). The role of e-banking on operational efficiency of banks in Nigeria. *Basic Research Journal of Business Management and Accounts, 6(1): 01-10.*

Uzoagulu, A.E. (1998) Practical guide to writing project reports in tertiary institutions. *John Jacobs Classic Publishers, Enugu.*

Williamson, G. D. (2010). Enhanced Authentication in online Banking. *Journal of Economic Crime Management,* 4(2):12-23.

Woherem, E. W. (2010). Information and Communication Technology in the Nigerian Banking Industry, *Spectrum, Ibadan, 190PP*.