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Finaning Small Size Businesses In Nigeria: A Critical Factor For Building Economic Resilience

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Abstract
This research evaluated the influence of small scale businesses financing on the output growth of small and medium size enterprises (SMEs) in Nigeria for the period 1982-2022. In attempt to achieve robust empirical results, stationarity tests were undertaken with the applications of the Augmented Dickey-Fuller unit root test and Zivot-Zandrews structural adjusted unit root test. The outcome of the unit root tests, led the study into employing the Autoregressive Distributed Lag (ARDL) model, and Dynamic ARDL simulation and Kernel-Based Regularized Least Squares (KRLS) models were used estimation boost to estimate the variables of the study. The variables utilized in the investigation were SMEs output as the explained variable, while banks loans to SMEs, lending cost, inflation rate, exchange rate and broad money supply were employed as the explanatory variables. The results reported that banks loans to SMEs had a significant average marginal influence on output growth of SMEs in Nigeria, though negative. The decreasing average marginal effect of SMEs output in the estimation results shows that banks loans conditions were not favourable for SMEs operations in the economy. The results also unveiled that inflation rate had a significant but a decreasing average marginal impact on SMEs output growth, while broad money supply reported significant and an increasing average marginal impact on the SMEs output growth in the economy. Finally, it was also revealed that lending cost had not significantly affected SMEs output while exchange rate exerts significant but negative impact on SMEs output in Nigeria. On the above note, the study recommended among others: that the monetary authorities in Nigeria should restructure commercial banks loan conditions to ensure that it is not too stringent for SMEs operators in accessing loans but should be made more flexible to attract more investors' demand for investment funds. More so, money supply should be increased through purchasing of government bonds by government in the open markets. This will raise quantity of money in circulation and hence, improved SMEs output growth in Nigeria.

Keywords: *Financing, Small size, Businesses, Critical Factor, Building, Resilience*

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I. Introduction

Financing small and medium sized enterprises are very essential for the growth and development of small and medium scale enterprises (SMEs) in every nation of the World; as a well harnessed and developed SMEs tends to brings about industrialization, innovation, job creation, poverty reduction, income equality, economic diversification and sustainable growth in the economy, especially in developing economy like Nigeria (Bosede et al., 2016). However, despite the important role played by small and medium scale industries in catalyzing economic growth in an economy, the Nigeria's SMEs have over time suffered from several shocks, which are blamed on poor performance of industries in the country. These economic shocks range from poor financing of SMEs, foreign exchange rate depreciation, high inflation pressure, poor electricity supply to power SMEs production, high cost of business financing to poor demand for SMEs products. Others include bad economy such as low economic activities, high cost of borrowing, multiple taxation, poor state of infrastructure, government inconsistent policies on micro, small and medium enterprises, lack of awareness of SMEDAN policies and programme by SME managers, inadequate technological know-how and human capital deficiency. The small industries in Nigeria have also faced with high-interest rate on lending, inadequate access to finance, high level of insecurities, poor quality of governance, as well as poor legal framework and large firms influence (Emmanuel & Willie, 2021).

In the face of these economic shocks and challenges, Nigeria is now in dare need of building economic resilience for sustainable growth and development. This entails building but not limited to sustainable insurance system, reliable intervention policies, exchange rate stability, tax waivers, specialized banks for SMEs, and reducing excessive conditionalities for credit to micro sectors. It is also crucial to protect infant industries from big firms' competitions, provides hitch free imports and exports, revives and restores export free zone to facilitate export of goods produced by the SMEs subsector, provides adequate security in the country and as well reduces cost of doing business. However, as essential as the aforementioned are for SMEs to thrive in the economy, Nigeria grapples to sufficiently build resilience for better performing of SMEs.

Generally, one of the biggest challenges faced by SMEs in Nigeria is the limited access to traditional funding sources. Many SMEs do not have the collateral or credit history required to secure loans or other type of financing from banks or other financial institutions. This is compounded by high interest rates and collateral requirements associated with such financing, which makes it difficult for SMEs to repay loans or grow their businesses (The Cable news, February, 24, 2023). According to the International Finance Corporation (IFC), access to finance is one of the most significant constraints to the growth and sustainability of SMEs in Nigeria. Similarly, a 2018 report by the Central Bank of Nigeria (CBN) revealed that the most significant challenge faced by the SMEs in Nigeria is inadequate access to finance.

Another significant challenge confronting SMEs in the country is the limited support available from the venture capital and investor networks. While these sources of financing do exist in Nigeria, they are relatively small and often focused on larger, high-growth start-ups. This means that many SMEs are unable to access this type of funding, which limits their ability to scale and compete in the market. More so, the Small and Medium Enterprises Development Agency of Nigeria (SMEDAN) noted that most SMEs in Nigeria operate without adequate funding or credit support. In addition, a report by the International Trade Centre (ITC) in 2020 found that the vast majority of Nigerian SMEs are underfunded, with only 15 percent of SMEs accessing formal credits (Okonkwo, 2023).

Furthermore, the regulatory environment in Nigeria also makes it difficult for SMEs to access financing, especially from foreign investors. Nigerian policies and bureaucracy creates barriers for SMEs seeking funding, and many foreign investors are hesitant to invest in Nigerian SMEs due to concerns around the country's business climate and political instability. These challenges mean that many SMEs in Nigeria are forced to rely on personal savings or informal sources of financing, which limits their ability to grow and scale. This is especially problematic for businesses that are seeking to expand into new markets or introducing new products or services, as the costs associated with these endeavours can be significant. Similarly, most SMEs in the nation lack qualified personnel capacity to manage the activities of SMEs, which has resulted to inability of the firms to publish quality of financial information and as such are unable to provide audited financial statement, which is one of the criteria for accessing credits from the banks. Hence, inadequate or even lack of information on business financial condition, capital base, profits, and profits prospect results in incomplete or inaccurate publication. Faced with this kind of uncertainty, a lender denies credit in some occasion to the firms that are credit worthy but unable to make accurate report (Coleman, 2000).

However, the Nigerian SMEs, if adequately funded, especially in the industrial satellite cities such Aba in Abia State, Lagos State, Newi and Onitsha in Anambra State, among others would help to fill the funding gap left by traditional sources of financing in Nigeria. In that direction, the economy builds potential in jobs creation, economic diversification, new innovation, poverty reduction, increased GDP per capita, food security, exports growth, and sustainable economic growth. Thus, Nigerian SMEs must develop if the economy so desire to rank among the comity of the developed countries of the world, especially as the nation lacks requisite infrastructure and technology capacities to attract big enterprises from foreign investors in large numbers.

Accordingly, Gbandi and Amissah (2014) unveiled that SMEs were very essential part of Nigeria's economy as indicated by the International Finance Corporation (IFC) that SMEs approximately constitutes 96% of the total enterprises in Nigeria. They further upheld that about 90 percent of manufacturing or industrial sector in terms of number of enterprises in Nigeria is dominated by SMEs. However, despite the fact that the SMEs constituted over 90 percent of the Nigerian enterprises, its contributions to GDP remained about 1 percent only in the economy.

In order to adequately finance Nigerian SMEs, litany of financing agencies and schemes were enunciated by Nigerian government mainly to accelerate SMEs' contributions to economic growth. These development agencies and schemes were the Agricultural Credit Guarantee Scheme Fund (ACGSF) established in 1977, National economic reconstruction fund (NERFUND), 1989; Peoples bank of Nigeria (PBN), 1989, the Nigerian Export-Import Bank (NEXIM), 1991, microfinance banks established in 1992. Others include the Small and Medium Enterprises and Equity Investment Scheme (SMEEIS), 2010; the Bank of Industry (BOI), 2001; Small and Micro Enterprise Development Agency (SMEDAN), and the Central Bank of Nigeria (CBN) intervention fund on SMEs. Notwithstanding these intervention strategies, the SMEs performance in Nigeria

remained unimpressive, and hence this study as the economy is still characterized by several economic crises and low economic performance despite the efforts of the government to improve the economy.

For instance, in 1981, banks SMEs financing stood at 14 percent, and increased to 15 percent in 1991. In 2001, it improved to 17.7 percent, and rose again to 24.4 percent in 2011. By 2021, the banks financing of the SMEs increased to 34 percent but decreased to 11.6 percent in 2022. More so, in 1981, borrowing cost was reported at 6 percent, and increased to 15.5 percent in 1991. By 2001, it rose to 20.5 and dropped to 12 percent in 2011. In 2021, the borrowing cost declined again to 11.5 percent but rose to 16.5 percent in 2022 (CBN, 2022). Similarly, the cost of doing business in Nigeria stood at 20.8 percent in 1981, but declined to 13 percent in 1991. By 2001, it improved to 18.9 percent but fell to 10.8 percent in 2011. In 2021, it increased to 16.95 percent; and by 2022, the cost of running business in Nigeria again rose to 18.85 percent. On the other hand, in 1981, small and medium scale enterprises output growth rate stood at -5 percent, increased to 25 percent in 1991. By 2001, the output decreased to -2.5 percent; and in 2011, it improved to 29 percent. In 2021, the SMEs output fell to 27 percent; and further declined to 13 percent in 2022 (CBN, 2022).

Given the facts above, the study observed contradictions in the trend analyses, which violates economic postulation in the nexus between financing SMEs and the output of SMEs in an economy. It was discovered that when banks' SMEs financing increases and cost of borrowing decreases alongside fall in the cost of doing businesses, SMEs output decreases and vice-versa. For instance, as SMEs banks' financing rose from 15 percent in 1991 to 17.7 percent in 2001, SMEs output fell to -2.5 percent, and the same thing was applicable in 2021. Again, in 2021, when borrowing cost fell to 11.5 percent, SMEs output declined to 27 percent, to mention but few. However, the consequences of the contradictions are high unemployment rate (28%), high inflation rate (18.85%), and high poverty level which characterized the Nigeria's economy as at 2022 alongside decreases in GDP per capita of USD 2,207 in 2022, compared to USD 2,959 a decade earlier and naira exchange rate depreciation against US dollar (N1,600/USD) in 2024. It is against this problem that this research examines the impact of financing SMEs on its output growth in Nigeria.

II. Theoretical Framework

Schumpeterian Finance-Led Growth Hypothesis

The Schumpeterian finance-led growth hypothesis also known as the Schumpeter supply-leading theory was published by Joseph Alois Schumpeter in the 1934. Schumpeter (1934) explained that effective and efficient financial sector was needed to promote expansion in the real sector, which in turn, leads to growth. Held that the extent at which the financial sector operates efficiently and effectively or deepened determines the growth level of the economy (Adejoh, 2021). The theory opined that as the financial industry develops, the supply of financial services grows. It argued that expansion in the financial sector will result in optimal resource allocation, as causality flows from finance to growth without any feedback from growth. Hence, the theory held that an effective financial sector was a pre-condition for economic growth. In the Schumpeterian finance theory, it was postulated that in the long-run, efficient allocation of savings via the identification and extension of credit to SMEs and entrepreneurs with the best chances of successfully implementing innovative products and manufacturing processes promotes output growth. According to the theory, financial intermediation was a useful instrument for increasing productive capacity of the economy.

For Schumpeter's supply-leading theory, expansion of the financial sector spurs growth in the real sector through savings accumulation, risk management, project appraisal, management control, and financial institutions (Mokuolu & Oluwaleye, 2023). Similarly, Mckinnon (1973) and Shaw (1973) conceived that a functioned financial sector minimizes transaction and monitoring costs and asymmetric information, thereby promoting financial intermediation. It further assumed that the economy responds to growth in the real sector stimulated by financial sector development. Furthermore, the theory had the support of Goldsmith (1969), in which he upheld that finance was a very crucial and basic requirement for both short term and long term economic growth. He further reiterated in agreement with the Schumpeter that financial institutions facilitate exchange of goods and services through the mobilization of savings. In that, it assist in processing information concern investors and investment projects to stimulate efficient allocation of funds, monitor investments, and provide corporate governance after allocating the funds, and as well help in risk diversification, transformation, and management (Lioudis, 2021). The theory established that well functioning of financial institutions and markets allow all market participants to gain from the investments through funds allocation to their most productive uses.

Financial Repression Hypothesis

The Financial Repression hypothesis, developed by McKinnon (1973) and Shaw (1973) postulated that an economy should be regulated using high reserve requirements such as regulated interest rates and quantitative limitations of credit distribution. It opines financial suppression interacts with price inflation and restricts the supply of bank loans. Thus, large reserve demands limit extension of bank lending as fixed credit

programmes skew credit distribution. Consequently, this leads to investment retardation not only in relation to the amount but also as regards to quality, since lenders do not allocate available money in accordance with marginal productivity of investment, as leads to stagnation of an economy instead of progress.

The theory further explained that when interest rates are liberalized in developing countries, it results in increase in interest rate that would lead to a rise in savings, spur investments and improved economic growth. The initial framework of McKinnon (1973) and Shaw (1973) focused on financial repression and the need to alleviate financial repression through market mechanism to determine real interest rates, and remove credit control, among others. Therefore, if financial markets are liberalized, higher real interest rate would result in high savings and more loanable funds for investment. Mckinnon (1973) refers to this occurrence as the conduit effect. It further clears that the analysis of what increases investment contradicts the argument of the neoclassical theory. Unlike the neoclassical theory, the neoliberal approach asserts a direct relationship between real interest rate and investment. In other words, although the demand for investment may fall as a result of the interest rate, the actual level of investment increases due to a rise in the availability of funds for investment. However, this occurs when there is lack of funds for investment so that demand for funds exceeds the supply of funds.

The Financial Theory of Investment

This theory of investment was propounded by James Duesenberry in 1949. The theory is as well referred to as the cost of capital theory of investment. It was developed as a result of the accelerator theories ignoring the role of capital cost in investment decision by firms. The financial theory of investment upheld that market rate of interest represents the cost of capital to firm, which does not vary with the amount of investment made. This implies that unlimited funds are at firms' disposal at market rate of interest. This implies that the supply of funds to firms is very elastic. In reality, an unlimited supply of funds is not available to firm in any time period at the market rate of interest. As more and more funds are required by it for investment spending, the cost of funds rises. To finance investment spending, the firm needs to borrow in the market at whatever interest rate funds are available (Adenuga, 2020).

The theory was based on the proposition that gross investment exceeds depreciation at the growth of capital stock; investment exceeds savings when income grows; and the growth rates of income and capital stock are determined entirely by the ratio of capital stock to income (Adenuga, 2020). Duesenberry (1949) regards investment as a function of income (Y), capital stock (K), profit (π) and capital consumption allowances (R). All these are independent variables and can be represented as:

$$I=f(Y_t-1,K_t-1,\pi_{t-1},R_t) \quad 1$$

Where, (t) refers to the current period and ($t-1$) the previous period. According to Duesenberry (1949), profits depend positively on national income and negatively on capital stock.

In summary, the study adopts the Schumpeterian finance-led growth theory otherwise known as the Schumpeterian supply-leading theory of financial intermediation as the theoretical framework of this study. Though other theories reviewed are also relevant to this research but the adopted theory provides best explanation in terms of the relationship between financing SMEs and SMEs output performance in the economy. The theory noted that financial intermediation via efficient credit delivery to SMEs spur productive capacity of SMEs and hence, output growth. Thus, financial sector development and deepening is reflected in this research by the amount of credit delivered to micro, small and medium sized enterprises (MSMEs) within the nation. The transmission of the SMEs financing to SMEs output growth and development hinges on the fact that as money is created in conjunction with interest bearing debt, a growth is eminently created, specifically, the interest charged on debt is itself an underlying accelerator of growth in the economy.

Empirical Review

In order to properly contribute to literature debate in regards to the nexus between SMEs financing and output growth of SMEs in an economy, this research reviewed several empirical studies across countries of the world. Some of which include Ebrahim and Andualem (2022) that researched the role of micro, small and medium-sized enterprises (MSMEs) financing on the sustainable development of sub-Saharan Africa and its challenges in Ethiopia from 2011 to 2021 using review methods. The study found that MSMEs had a significant contribution to sustainable development goals in Ethiopia via alleviating poverty, creation of employment, and improving living standards.

More so, Oladimeji and Adewale (2022), Stefan, Mihai, Alexandra and Liliana (2020) investigated the impact of small and medium scale enterprises on economic growth across countries of the world including Nigeria, Roman , and found that commercial bank loans to SMEs had a significant influence on growth of the economies investigated. In a work done by Papka, Innocent and Enam (2019) on the impact of commercial bank credits to SMEs on agricultural output in Nigeria from 1980 to 2018, using unit root test, co-integration test and ordinary least square; showed that commercial bank credits had a positive and significant effect on agricultural

output in Nigeria. Similarly, Raphael (2020) researched the determinants of domestic private investment in the Gambia for the period 1980-2018, through the applications of unit root test and autoregressive distributed lag (ARDL) model. The results estimation indicated that real interest rate had a positive and significant effect on private sector investment in Gambia. Using the of Error Correction Model (ECM) and Engel Granger causality tests, John and Olorunfemi (2014) researched the role of small and medium scale enterprises (SMEs) financing as a catalyst for the growth of the Nigerian economy from 1980 to 2012. The results indicated that commercial bank financing significantly increase economic growth of Nigeria in the long-run, but not significant in the short-run.

Furthermore, James et al. (2018) researched the contribution of SMEs to economic development in Nigeria, using the descriptive research design, and the study discovered that significant relationship exists between small and medium-scale enterprises and economic growth in Nigeria. Using system generalized method of moment (GMM), Thuy, Anh and Diem (2020) examined the effect of monetary policy on SMEs private investment in Vietnam. The results showed that private investment is positively and significantly affected by monetary policies such as broad money supply, domestic credit and interest rate channels. In the same vein, Faiza, Longbao and Mahwish (2021) studied the nexus between small and medium scale enterprises (SMEs) and economic growth in Pakistan from 1990 to 2019, using the autoregressive distributed lag (ARDL) model. The estimation indicated that SME's output, human development index, and credit to the SMEs had a driving force of economic growth in both the short-run and the long-run. Employing the ordinary least square (OLS) technique, Bosede, Ogunleye and Arogundade (2016) evaluated the influence of small and medium scale enterprises financing on economic growth in Nigeria from 1981 to 2012. The results revealed that SMEs financing had not significantly affected economic growth in Nigeria.

Similarly, other studies reviewed in various countries of the world including Indonesia, Nigeria, Ethiopia, Turkey, Brazil, Vietnam, Zimbabwe, Jordan, among others revealed that SMEs had a significant and positive effect on economic growth, and these studies include Aladin, Evada, Yuliana and Yuli (2021), Emmanuel and Willie (2021), Amanu (2020), Ceren and Gokhan (2020), Marcelo and Joseph (2019), Adejoh (2021), Etuk, Etuk and Michael (2014), Rasak (2012), Nguyen et al. (2022), Mba and Cletus (2014), Imoisi and Ephraim (2015), Ameh, Alao and Amiya (2020), Iloh and Chioke (2015), Yahaya (2015), Muritala, and Awolaja and Bako (2012). Also showed significant and positive relationship between the SMEs and economic growth in their studies include Lenon and Dephine (2019), God'stime (2013), Gbandi and Amissah (2014), Idowu, Ochei and Isibor (2019), Idih, Oluwagbemigun and Adewole (2020), James and Henry (2015), Oluwafemi, Enisan and Elumilade (2014), Ebi and Emmanuel (2014), Emecheta and Ibe (2014), Hussaini, Auwal and Damina (2021). In contrary, Lionel and Samuel (2018), Charles, Obumneke and Udo (2020), Alabi, Awe and Musa (2015), Kanu and Nwadiubu (2021), Clement, Ayode and Rafiat (2018), Lyndon and Opinion (2021), Eyad (2021) and Nwosu and Ochu (2017) in their researches found negative but significant with some found no significant impact of SMEs financing on the growth of the economies studied.

Gap in Literature

This study is an improvement on other studies undertaken on the topic of the impact of small and medium scale enterprises financing across the countries of the world, Nigeria inclusive. The gap in literature of this research is established basically on the grounds of methodological gap. From the studies reviewed, it was discovered that scholars such as Oladimeji and Adewale (2022), John and Olorunfemi (2014), Bosede, Ogunleye and Arogundade (2016), Emmanuel and Willie (2021), Adejoh (2021) did similar study on the topic under consideration by specifying GDP as a function of independent variables such as commercial bank credits to small and medium scale enterprises, lending cost or interest rate, cost of doing business or inflation rate and unemployment rate. However, this study improved on these studies by adding gross domestic production variable to the model due to its role in determining SMEs output growth of Nigeria. Similarly, the studies reviewed employed several econometric techniques ranging from ordinary least squares, fully modified ordinary least squares, vector autoregressive model (VAR), co-integration test to autoregressive distributed lag (ARDL) model which are designed to cater for linear regression model. However, this study differs from these studies reviewed by utilizing the Dynamic ARDL simulation and Kernel-Based Regularized Least Square (KRLS) methods which is designed to estimate both the linear and the non-linear regression models in view of the fact that economic models are by nature non-linear model. In this new method, average marginal effects of the explained variable due to changes in the explanatory variables would be determined, which other studies ignored in their works.

III. Methods

Theoretical Model

The theoretical model of this study is anchored on the Schumpeterian financial-led growth hypothesis and financial regression hypothesis framework. The model recognizes the amount of credit to SMEs as a critical

factor for the growth of small industries in the economy. The Schumpeterian finance-led growth theoretical model is specified as follows:

$g_i = \beta_0 + \beta_1 findev_i + \beta_2 X_i + u_i$ 2

Where, g_i denotes average growth rate in the economy during i period, $findev_i$ represents the nation's level of financial development, X_i is a vector of controls such as policy variables (e.g. interest rate, money supply), education, political stability, initial income per capita, among others) and u_i is an error term. On the other, the McKinnon model is expressed as:

$\left(\frac{M}{P}\right) d = f(Y, r, d - \pi^*)$ 3

$\left(\frac{I}{Y}\right) p = f(r, d - \pi^*)$ 4

Where, $\left(\frac{M}{P}\right) d$ is the demand for real money balances, Y denotes real GDP, $\left(\frac{M}{P}\right)$ represents real money balances, $\left(\frac{I}{Y}\right) p$ is the ratio of private investment to GDP, $d - \pi^*$ is the real deposit rate, r = real return on physical capital, and π^* is the expected inflation rate. The McKinnon's complementarity hypothesis requires the partial derivatives,

$\frac{\partial(\frac{M/_P}{P})}{\partial(\frac{I}{Y})} > 0$ and, 5

$\frac{\partial(\frac{I}{Y})}{\partial(d - \neq^*)} > 0$ 6

The equations 5 and 6 indicate that it is not the cost of capital that constrains investment in the financially regressed economies, but the availability of finance. Hence, when the real deposit rate rises, investment increases as well, as the financial constraint is relaxed. However, the traditional theory suggests the reverse, that is, that an increase in interest rate reduces investment. From equation 5, we form equation by making Y the subject of the formula

$Y = (r, d - \pi^*) - \left(\frac{M}{P}\right) d$ 7

The equation 6 shows that real GDP is a function of real return on physical capital, real deposit rate and money demand in subtraction.

Comparing equations 1 and 6, we have:

$g_i = \beta_0 + \beta_1 findev_i + \beta_2 X_i + u_i = Y = (r, d - \pi^*) - \left(\frac{M}{P}\right) d$

8

Collecting like terms, we have the equation 8 below:

$(g_i - Y) = \beta_0 + \beta_1 findev_i + \beta_2 (X_i - d - \pi^*) + \beta_3 r_i - \beta_4 \left(\frac{M}{P}\right) d + u_i$

9

Where, $(g_i - Y)$ denotes real GDP, $(X_i - d - \pi^*)$ represents real interest rate or lending rate, π^* is the expected inflation, r is the real return on physical capital, $\left(\frac{M}{P}\right) d$ is the demand for money, β_0 is the constant term, β_{1-4} are coefficients of the regression equations and subscript i represents time period. However, the Schumpeterian finance-led growth theoretical model was modified and adopted in the work of John and Olorunfemi (2014), as shown in the equation below:

$GDP = f(BSMEs, LC, CDB)$ 10

Where, GDP = Gross domestic product, CBLSMEs = Commercial bank loans to small and medium scale enterprises, LC = Lending cost proxied by interest rate and CDB = Cost of doing business proxied by inflation rate. In order to capture the interest of this study, the equation 9 is modified to include SMEs output as dependent variable while gross domestic product is employed as independent variable due to its important in determining changes in SMEs growth in Nigeria. Thus, the model as modified is expressed in functional form as follows:

$SMEsO = f(BSMEs, LC, INF, EXR, M_2)$ 11

In linear function, the model is specified as:

$\mathrm{SMEO_t} = \emptyset_0 + \emptyset_1 \mathrm{BSMEs_t} + \emptyset_2 \mathrm{LC_t} + \emptyset_3 \mathrm{INF_t} + \emptyset_4 \mathrm{EXR_t} + \emptyset_5 \mathrm{M2_t} + \mu_t$

12

In logarithm function, the equation is specified thus:

$\mathrm{lnSMEO_t} = \emptyset_0 + \emptyset_1 \mathrm{lnBSMEs_t} + \emptyset_2 \mathrm{LC_t} + \emptyset_3 \mathrm{INF_t} + \emptyset_4 \mathrm{lnEXR_t} + \emptyset_5 \mathrm{lnM2_t} + \mu_t$ 13

Where SMEO = Small and medium scale enterprises output, BSMEs = Bank credits to small and medium scale enterprises, LC = Lending cost as proxy for interest rate, INF = Inflation rate, EXR = Exchange rate and M2 = Broad money supply. More so, $\emptyset_0$ is the constant term, t is the time period, ln is the logarithm

conversion and it measures elasticities of the variables, u_t is the error term, and $\emptyset_{1-4}$ are the parameters of the regression equations.

A Priori Expectation

The study expects the variables such as bank credits to small and medium scale enterprises, broad money supply and exchange rate to have positive relationship with SMEs output, while lending cost and inflation rate are expected to have negative nexus with SMEs output growth in the economy. The a priori expectation pattern of movement would be: φ1>0, φ2<0, φ3<0, φ4>0, φ4>0, φ4>0, φ4>0.

Sources of Data

This study investigated the impact of small and medium scale enterprises on economic growth in Nigeria with main focus on building resilience for sustainable growth. Historical data for the investigation are obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin, volume 33, 2022, and volume 13, 2005, and World Bank Development Indicators, 2022.

Estimation Procedure

Unit root test

Unit root test: Augmented Dickey-Fuller (ADF) test

The overriding way of determining non-stationarity of a variable is described as unit root test. One of the ways testing the unit root is through the application of the Dickey and Fuller (1979) approach and it based on the theoretical model as presented in generic form:

$$\Delta logSMEO_t = a_0 + \rho_t + a_1 logSMEO_{t-1} + \sum_{i=1}^{n} a_1 \Delta logSMEO_{t-i} + e_t \quad 14$$

$$\Delta logSMEO_t = a_0 + \rho_t + a_1 logSMEO_{t-1} + \sum_{i=1}^{n} a_1 \Delta logSMEO_{t-i} + \delta_t + e_t \quad 15$$

$$\Delta logBSMEs_t = a_0 + \rho_t + a_1 logBCSMEs_{t-1} + \sum_{i=1}^{n} a_1 \Delta logBCSMEs_{t-i} + e_t \quad 16$$

$$\Delta logBSMEs_t = a_0 + \rho_t + a_1 logBCSMEs_{t-1} + \sum_{i=1}^{n} a_1 \Delta logBCSMEs_{t-i} + \delta_t + e_t \quad 17$$

$$\Delta LC_t = a_0 + \rho_t + a_1 LC_{t-1} + \sum_{i=1}^{n} a_1 \Delta LC_{t-i} + e_t \quad 18$$

$$\Delta LC_t = a_0 + \rho_t + a_1 LC_{t-1} + \sum_{i=1}^{n} a_1 \Delta LC_{t-i} + \delta_t + e_t \quad 19$$

$$\Delta INF_t = a_0 + \rho_t + a_1 INF_{t-1} + \sum_{i=1}^{n} a_1 \Delta INF_{t-i} + e_t \quad 20$$

$$\Delta INF_t = a_0 + \rho_t + a_1 INF_{t-1} + \sum_{i=1}^{n} a_1 INF_{t-i} + \delta_t + e_t \quad 21$$

$$\Delta logEXR_t = a_0 + \rho_t + a_1 logEXR_{t-1} + \sum_{i=1}^{n} a_1 \Delta logEXR_{t-i} + e_t \quad 22$$

$$\Delta logEXR_t = a_0 + \rho_t + a_1 logEXR_{t-1} + \sum_{i=1}^{n} a_1 \Delta logEXR_{t-i} + \delta_t + e_t \quad 23$$

$$\Delta logM2_t = a_0 + \rho_t + a_1 logM2_{t-1} + \sum_{i=1}^{n} a_1 \Delta logM2_{t-i} + e_t \quad 24$$

$$\Delta logM2_t = a_0 + \rho_t + a_1 logM2_{t-1} + \sum_{i=1}^{n} a_1 \Delta logM2_{t-i} + \delta_t + e_t \quad 25$$

Where; SMEO, BSMEs, LC, INF, EXR and M2 are the variables whose order of integration are being determined, Δ = first difference operator in a manner that $\Delta SMEO_{t-1} = SMEO_t - SMEO_{t-1}$, $\Delta BCSMEs_{t-1} = BSMEs_t - BSMEs_{t-1}$, $\Delta LC_{t-1} = LC_t - LC_{t-1}$, $\Delta INF_{t-1} = INF_t - INF_{t-1}$, $\Delta M2_{t-1} = M2_t - M2_{t-1}$, α_0 = constant term, t = linear time trend of the variable, n = the optimum number of lags, and et is the random variable. If the test ADF at levels rejected the test, it indicates no unit root in the variable, and it is integrated of order zero. But if the test ADF failed at levels to reject the test but at first differencing rejected the test, it indicates one unit root in the variable, and it is integrated of order one. Similarly, if the test of ADF failed at both levels and first differencing

to reject the test, but the test is rejected at second differencing; the implication is that the variable contained two unit roots; thus, it is integrated of order two.

Unit root test: Zivot-Andrews (Zandrews) test

Zivot and Andrews (1992) in attempt to develop reliable model for testing unit root of series, modified the Phillips-Perron unit root model focusing on how to determine an exogenously break date into an unconditional unit root test. In the model, instead of treating the break date as fixed, it tested the estimated break date. Zivot and Andrews applied intervention outlier model for changing growth model instead of the additive outlier model as put forward by Phillips-Perron model. The generic Zivot- Andrews regression model is given as follows:

$$\hat{SMEO}^B{}_t = \hat{\alpha}^B \hat{SMEO}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{SMEO}^B{}_{t-1} + \hat{\varepsilon}_t \quad 26$$

$$\hat{BSMEs}^B{}_t = \hat{\alpha}^B \hat{BSMEs}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{BSMEs}^B{}_{t-1} + \hat{\varepsilon}_t \quad 27$$

$$\hat{LC}^B{}_t = \hat{\alpha}^B \hat{LC}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{LC}^B{}_{t-1} + \hat{\varepsilon}_t \quad 28$$

$$\hat{INF}^B{}_t = \hat{\alpha}^B \hat{INF}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{INF}^B{}_{t-1} + \hat{\varepsilon}_t \quad 29$$

$$\hat{EXR}^B{}_t = \hat{\alpha}^B \hat{EXR}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{EXR}^B{}_{t-1} + \hat{\varepsilon}_t \quad 30$$

$$\hat{M2}^B{}_t = \hat{\alpha}^B \hat{M2}^B{}_{t-1} + \sum_{i=1}^{k} \hat{C}_i^{\,B}\, \Delta \hat{M2}^B{}_{t-1} + \hat{\varepsilon}_t \quad 31$$

Where, $\hat{SMEO}^B{}_t$, $\hat{BSMEs}^B{}_t$, $\hat{LC}^B{}_t$, $\hat{INF}^B{}_t$, $\hat{EXR}^B{}_t$ and $\hat{M2}^B{}_t$ are the residuals from a regression with SMEO, BSMEs, LC, INF, EXR and M2 as the explained variables and where the explanatory variables contains a constant, time trend and deterministic trend. Furthermore, it treated the structural break as an endogenous occurrence and the null hypothesis for the model is given as:

$$SMEO_t = \alpha_0 + SMEO_{t-1}\, e_t \quad 32$$

$$BCSMEs_t = \alpha_0 + BCSMEs_{t-1}\, e_t \quad 33$$

$$LC_t = \alpha_0 + LC_{t-1}\, e_t \quad 34$$

$$INF_t = \alpha_0 + INF_{t-1}\, e_t \quad 35$$

$$EXR_t = \alpha_0 + EXR_{t-1}\, e_t \quad 36$$

$$M2_t = \alpha_0 + M2_{t-1}\, e_t \quad 37$$

The selection of breakdown for the variable was viewed as an outcome of an estimation procedure that is designed to fit dependent variable to a certain trend stationary representation. Zivot and Andrews assumed that the alternative hypothesis specifies that the dependent variable can be a trend stationary process with one break in the trend which occurs at an unknown point in time.

Autoregressive Distributed Lag (ARDL) Model

The Autoregressive distributed lagged (ARDL) is employed since the time series variables are integrated of different orders. The approach is suitable most especially when the Johansen and Juselius (1990) model is inappropriate. The term Distributed lag connotes the inclusion of lagged regressors in the model. The outcome of this model shows whether the variables are cointegrated or not. The equation is expressed as:

$$\begin{aligned}\Delta lnSMEO_t = \omega_0 + \sum_{i=1}^{p} \omega_1\, InSMEO_{t-i} + \sum_{i=1}^{p} \omega_2\, lnBSMEs_{t-i} + \sum_{i=1}^{p} \omega_3\, LC_{t-i} + \sum_{i=1}^{p} \omega_4\, INF_{t-i} \\ + \sum_{i=1}^{p} \omega_6\, EXR_{t-i} + \sum_{i=1}^{p} \omega_7\, InM2_{t-i} + lnBSMEs_t + \phi_2 LC_t + \phi_3 INF_t + \phi_4 InEXR_t \\ + \phi_5 lnM2_t + \phi_6 ECT_{t-1} + \varepsilon_t \quad 38\end{aligned}$$

Where, SMEO denote small and medium scale enterprise, t is current time, BSMEs stands for bank credits to small and medium scale enterprises, LC represents lending cost as a proxy for interest rate, INF is the inflation rate, EXR is the exchange rate and M2 represents broad money supply. Also, ECT is error correction term, ln is the natural log, ε is error term, p is maximum lag term. The symbol Δ stands for first difference. $\omega_1 - \omega_5$ measures the short-run effect while $\phi_1 - \phi_4$ determine the long-run effect.

The ARDL bounds cointegration test includes estimating equation 33 and confining the factors of the lag level variables to zero. Thus, the study checks the hypothesis from equation 33 that is illustrated below:

H_0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0 = \varphi_6 = \varphi_7 = 0$

H_1: $\varphi_1 \neq \varphi_2 \neq \varphi_3 \neq \varphi_4 \neq \varphi_5 \neq \varphi_6 \neq \varphi_7 \neq 0$

The corresponding measured F-statistic is then compared with the Pesaran, Shin and Smith (2001) two asymptotic critical value limits to confirm the presence of cointegration in the equation. The last stage here is the investigation of error correction model (ECM) expressed as:

$$\Delta lnSMEO_t = \delta_0 + \sum_{i=1}^{n} \delta_{1i}\, \Delta lnSMEO_{t-i} + \sum_{i=1}^{n} \delta_{2j}\, \Delta lnBSMEs_{t-i} + \sum_{i=1}^{n} \delta_{3i}\, \Delta LC_{t-i} + \sum_{i=1}^{n} \delta_{4i}\, INF_{t-i} + \sum_{i=1}^{n} \delta_{5i}\, \Delta lnEXR_{t-i} + \sum_{i=1}^{n} \delta_{6i}\, M2_{t-i} + \lambda ECM_{t-1} + u_t \quad 39$$

Although ARDL cointegration method does not require pre-testing for unit roots, to avoid ARDL model crash in the presence of integrated stochastic trend of I(2), the study is of the view that the unit root test is essential to know the number of unit roots in the series under consideration and determine the appropriate econometric technique for the estimation of the variables under review.

Dynamic ARDL Simulation Model

The dynamic ARDL simulation model was developed to simulate a number of ARDL models including an error-correction model to overcome the difficulties involved in interpreting conventional ARDL models. The dynamic simulation provides an option in testing model's coefficients by conveying the statistical importance of the estimates via situations that are realistic counterfactual. While holding other variables constant, it simulates, estimates, and graphs the prediction of counterfactual changes in one independent variable on the dependent variables. The ARDL model with dynamic simulations is used in econometric analysis due to its numerous advantages. Hence, the generic dynamic ARDL model is specified as follows:

$$lnSMEO_t = a_0 + \varphi_1 lnSMEO_{t-1} + \theta_{1,0} lnBSMEs_{1,t} + \theta_{2,0} LC_{2,t} + \theta_{3,0} INF_{3,t} + \theta_{4,0} lnEXR_{4,t} + \theta_{5,0} lnM2_{5,t} + \theta_{1,1} lnBSMEs_{1,t-1} + \theta_{2,1} LC_{2,t-1} + \theta_{3,1} INF_{3,t-1} + \theta_{4,1} lnEXR_{4,t-1} + \theta_{5,1} lnM2_{5,t-1} + e_t \quad 40$$

Similarly, to estimate is its non-stationarity and cointegrating variant, referred to as an error correction model with the following model:

$$\Delta lnSMEO_t = a_0 + \varphi_1 lnSMEO_{t-1} + \theta_{1,1} lnBSMEs_{1,t-1} + +\theta_2 LC_{2,t-1} + \theta_3 INF_{3,t-1} + \theta_4 lnEXR_{4,t-1} + \theta_5 lnM2_{5,t-1} + \beta_1 \Delta BSMEs_{1,t} + \beta_2 \Delta LC_{2,t} + \beta_3 \Delta INF_{3,t} + \beta_4 \Delta lnEXR_{4,t} + \beta_5 \Delta lnM2_{5,t} + e_t \quad 41$$

Equation 41 demonstrates the first difference of the dependent variable $lnGDP$ at time t = 1, 2,..,tk as a function of an intercept (a_0), the first lag of the regressnd in levels ($lnGDP_{t-1}$), the first lag of regressors in levels, $lnBSMEs_{1t\text{-}1}$, $LC_{2t\text{-}1}$, . . . , $lnM2_{4t\text{-}1}$, and up to maximum lags p and q_i, i = 1, 2, . . . , k of the first differences of regressed and regressors, with an error term e_t. The first differences are included to account for autocorrelation and delayed effects.

Kernel-Based Regularized Least Square (KRLS) Model

After the dynamic ARDL Simulations is estimated, the study proceeds to apply the Kernel-based Regularized Least Squares (KRLS), a machine learning algorithm that executes pointwise derivatives to investigate causal-effect relationship. To account for future economic performance, the research examine the structural adjustments in SMEs output growth employing empirical estimation through pointwise marginal effect.

$$k(xj, xi) = e^{-\frac{IIx_j - x_iII^2}{\sigma^2}} \quad 42$$

Where, e^x is the exponential function and $IIx_j - x_iII$ is the Euclidean distance between the covariate vectors x_j and x_i. This function is the same function as the normal distribution, but with σ^2 in place of $2\sigma^2$, and omitting the normalizing factor $1/\sqrt{2\pi\sigma^2}$ The most essential feature of the kernel model is that it gets to its maximum of one only when $x_i = x_j$ and grows closer to zero as x_i and x_j become more distant. More so, $k(xj, xi)$ is the measure of the similarity of x_i to x_j. Under the "similarity-based view," it is asserted that the target function y =f(x) can be approximated by some function in the space of functions represented by:

$$f(x) = \sum_{i=1}^{N} C_i k(x, x_i) \quad 43$$

Where $k(x, x_i)$ measures the similarity between our point of interest (x) and one of N input patterns x_i, and c_i is a weight for each input pattern. The key reason behind this approach is that it does not model y_i as a linear function of x_i. Rather, it leverages information about the similarity between observations.

IV. Results And Discussions

This subsection presented results estimated using econometric methods and subsequently discusses in line with the objectives of the study. The results are as presented below:

Unit Root Test

In order to detect the ranking order of integration among the variables employed in the study, the study tested for stationarity of the variables used in the research via the applications of the Augmented Dickey-Fuller (ADF) unit root test and Zivot-Andrews (ZA) Structural Adjusted unit root test. The results are presented in Table 1 below.

Table 1: Unit Root Test

Variables	Level.ADF	Δ.ADF	Level.ZA	Δ.ZA	Rank
SMEO	-2.057	-6.188**	-3.177	-6.807**	I(1)
lnBSMEs	-1.846	-6.323**	-3.456	-6.809**	I(1)
LC	-3.387	-8.628**	-4.500	-9.652**	I(1)
INF	-3.048*	-5.909**	-5.007*	-8.079**	I(0)
EXR	-2.167	-5.431**	-2.942	-6.149**	I(1)
lnM2	-1.351	-4.153**	-2.539	-5.936**	

Sources: Computation from Stata 16.0

Note: Level.ADF and Δ.ADF represent unit root test at level and first-difference of the Augmented Dickey-Fuller stationarity test; whereas Level.ZA and Δ.ZA stand for the level and first-difference of Zivot-Andrews structural adjusted unit root test; * and ** connote rejection of null hypothesis at 5% level of significance. From the Table 1, the results reported that all the variables except inflation rate (INF) were not stationary at level; but at first differencing, all the non-stationarity variables indicated stationarity. Hence, the results of the unit root test suggest order of integration at different level, that is, integrated of I(1) and I(0) at both the ADF and ZA unit root tests.

Optimal Lag Length Criteria

Table 2: Selection-Order Criteria

lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-495.717				11837	26.4062	26.4982	26.6647
1	-291.46	408.51	36	0.000	1.73117	17.5505	18.1945	19.3605*
2	-263.253	56.414	36	0.016	3.02183	17.9607	19.1566	21.322
3	-231.312	63.881	36	0.003	5.69022	18.1743	19.9223	23.0871
4	-151.631	159.36*	36	0.000	1.52567*	15.8753*	18.1752*	22.3395

Source: Computation from Stata 16.0

Table 2 reveals the optimal lag length selection-order criteria results. From the results, optimal lag length selected for the estimation of the variables is lag 4.

Autoregressive Distributed Lag (ARDL) Estimation Results

The ARDL model is basically employed to estimate the long-run nexus and short-run interactions among the variables under study. The results are as Tabulated below:

Table 3: ARDL Estimation Model

EQN	COEF.	Estimate	SE	t-Stat	P-Value	Min 95	Max 95
ECT	$SMEO_{t-1}$	-0.5492744	0.1352978	-4.06	0.000**	-0.0292976	0.4660964
Long-Run	$lnBSMEs_{t-1}$	-1.543747	01.065777	-1.45	0.160	-3.743402	0.6559083
	LC_{t-1}	0.9574049	0.3067756	3.12	0.005**	0.3242511	1.590559
	INF_{t-1}	-0.0377274	0.0389633	-0.97	0.343	-0.1181437	0.0426889
	$lnEXR_{t-1}$	-7.554459	1.682259	-4.49	0.000	-11.02647	-4.082448
	lnM2	4.69669	1.184004	3.97	0.001	2.253026	7.140353
	_Cons	50.16357	6.485197	7.74	0.000**	36.77878	63.54836
Short-Run	ΔSMEO	0.2183994	0.1200141	1.82	0.003**	0.0591695	0.2421379
	ΔlnBSMEs	-0.8479408	0.5507423	-1.54	0.137	-1.984617	0.2887354
	ΔLC	0.1229511	0.1062501	1.16	0.259	-0.0963383	0.3422405
	ΔINF	-0.0207227	0.0198153	-1.05	0.306	-0.0616195	0.0201741
	L2ΔlnEXR	3.110716	1.315682	2.36	0.026**	0.3952827	5.82615
	Δ1lnM2	-1.406931	3.216088	-0.44	0.666	-8.044609	5.230748
ARDL(2,0,1,0,4,1)	**OBS**	**38**		**R^2**	**0.7960**	**Root MSE**	**1.6091**

Source: Computation from Stata 16.0

Table 3 reported the ARDL estimation results, in which SE represents standard error; ** denotes statistical significance at 5% level. The results revealed that banks loans to SMEs (lnBSMEs) with a negative coefficient of -1.543747exert no significant (0.160) impact on SMEs output (SMEO), lending cost (LC) with a positive coefficient of 0.9574049 affected SMEs output significantly (0.005). More so, inflation rate (INF) having a negative coefficient of -0.0377274 had not significantly (0.343) impacted on SMEs output while exchange rate (lnEXR) with a negative coefficient of -7.554459 had a significant (0.000) influence on the SMEs

output and broad money supply (lnM2) having a positive coefficient value of 4.69669 had a significant (0.001) impact on SSMEs output in Nigeria in the long-run. Similarly, tt was also reported that exchange rate (lnEXR) with a positive coefficient of 3.110716 had a significant (0.026) influence on SMEO, while banks loans to SMEs (lnBSMEs), interest rates (IR), inflation rate (INF) and broad money supply (lnM2) had no significant impact on SMEs output in Nigeria in the short-run

Furthermore, the error correction term ECT(-1) has a coefficient value of -0.5492744 with a p-value of 0.000. The coefficient of the ECT term reported as the speed of adjustment is negative, fractional and statistically significant. As desired, the coefficient borders between -1 and 0 for convergence to occur. The result means that SMEO adjusts to lnBSMEs, LC, INF, lnEXR and lnM2 in the long-run equilibrium nexus. Thus, the system corrects its short-run deviation at a speed of 54.9% towards long-run relationship yearly. Similarly, the estimation revealed multiple coefficient of determination (R^2) of 0.7960, implying that 79.6% of the changes in the small and medium scale enterprises output is explained by the changes in the explanatory variables, whereas the remaining 20.4% is attributed by other variables excluded from the regression equation. In addition, root mean square error (Root MSE) value indicated 1.6091, which means that the estimation results showed low average prediction error.

ARDL Bounds Test

Since the unit root properties of the sampled variables have been tested with the variables estimated via the ARDL model, the research went ahead to investigated the cointegration through the modified Pesaran, Shin, and Smith (2001) ARDL bounds test with Kripfganz and Schneider critical values. Anchored on ARDL(2,0,1,0,4,1), the results are presented below:

Table 4: Pesaran, Shin, and Smith bounds test

K		10%		5%		1%		KS Critical Bands	
		1(0)	I(1)	1(0)	I(1)	1(0)	I(1)	1(0)	I(1)
F	5.951	2.298	3.513	2.775	4.166	3.948	5.754	0.001	0.008
t	-4.060	-2.476	-3.785	-2.851	-4.237	-3.623	-5.166	0.004	0.066

Source: Computation from Stata 16.0

Notes: I(0) and I(1) represent both lower and upper critical band values at 10%, 5% and 1% level of significance of Pesaran, Shin, and Smith ARDL bounds test; accept if F-calculated > critical value for I(0) regressors or reject if F > critical value for I(1) regressors.

Table 4 unveils the ARDL bounds test for long-run relationship among the variables studied in the investigation. The F-statistic based on a sample of 6 variables, 38 observations, and 6 short-run parameters is 5.951 while t- statistic is -4.060. since the F-statistic of 5.951 exceeds the upper bound critical values (4.166) at 5% significance level and greater than the critical values of all I(1) variables in 10% and 1% significant levels, as well as the KS critical values, the study rejects the null hypothesis of no level relationship as both PSS bounds test and Kripfganz-Schneider critical values confirm evidence of long-run equilibrium relationship in the regression equations.

Diagnostic Test

In order to test for structural serial correlation, validity and stability of the parameters of the regression model used in the study, diagnostic tests were conducted; using the Breusch-Godfrey LM serial correlation test, ARCH heteroscedasticity test and cumulative sum residual test. The results are expressed as followings:

Table 5: Breusch-Godfrey LM Test for Autocorrelation
H_0: No Serial Correlation

lags(*p*)	Chi2	Df	Prob > chi2
1	1.525	1	0.2169

Source: Computation from Stata 16.0

Table 6: Heteroskedasticity (ARCH) Test
H_0: No ARCH Effects

lags(*p*)	Chi2	Df	Prob > chi2
1	1.728	1	0.1887

Source: Computation from Stata 16.0

Specification Test

Ramsey RESET test using powers of the fitted values of D.gdp
Ho: model has no omitted variables

Table 7: Ramsey RESET test

F(3, 11)	Prob > F
2.09	0.1360

Source: Computation from Stata 16.0

These diagnostic tests were conducted in order to overcome the problems of serial correlation, heteroskedasticity, miss-specification model, and violation of normality conditions. The results in table 5, reported a chi-square of 1.525 and p-value of 0.2169, which indicates that no evidence of serial correlation exists in the regression model at 5% significance level. In Table 6, the ARCH heteroskedasticity test revealed a Chi-square value of 1.728 and a p-value of 0.1887, which implies that the residuals of the estimation model are homoscedastic at 5% level. Model mis-specification was also tested employing the Ramsey Reset test, and the results showed an F-statistic of 2.09 with an associated p-value of 0.1360. the result showed that the model has no omitted variables. Thus, the model is accurately specified.

Stability Test

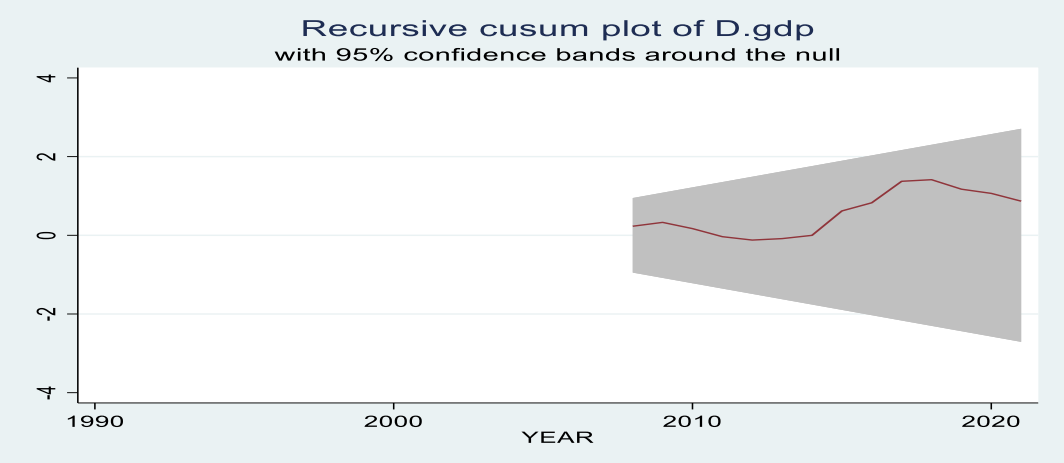

Figure 1: Cumulative Sum (CUSUM) of Residuals Test

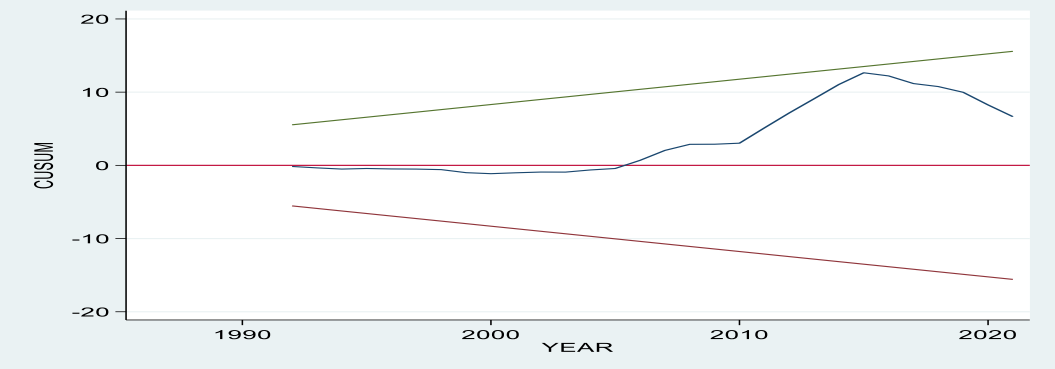

Figure 2: Cumulative Sum (CUSUM) of Square Test

Figures 1 and 2 show the Cumulative sum (CUSUM) of residuals and cumulative sum of squares (CUSUMSQ) tests. While the CUSUM of residuals test determines whether there are systematic changes in the model's parameters, the CUSUM of squares test detects sudden variations in the error terms. These tests were used to determine if there was stability in the parameters and constancy of the regression equation. The results, therefore, indicated stability in the parameters as both the CUSUM residuals and the CUSUMSQ plots fell within critical bands at a 5% significance level.

Dynamic ARDL Simulated model

The dynamic ARDL simulations method is estimation technique which detects potential shocks in policy changes in economic model of a country. In this study, the dynamic ARDL simulation is based on -1% contributions utilized as counterfactual shock over a 30 year periods. The plots of the parameter of the dynamic simulated ARDL are shown Figures 3 with its expounded empirics indicated in Tables 8.

Predicted SMEO with -1% Δ in lnBSMEs

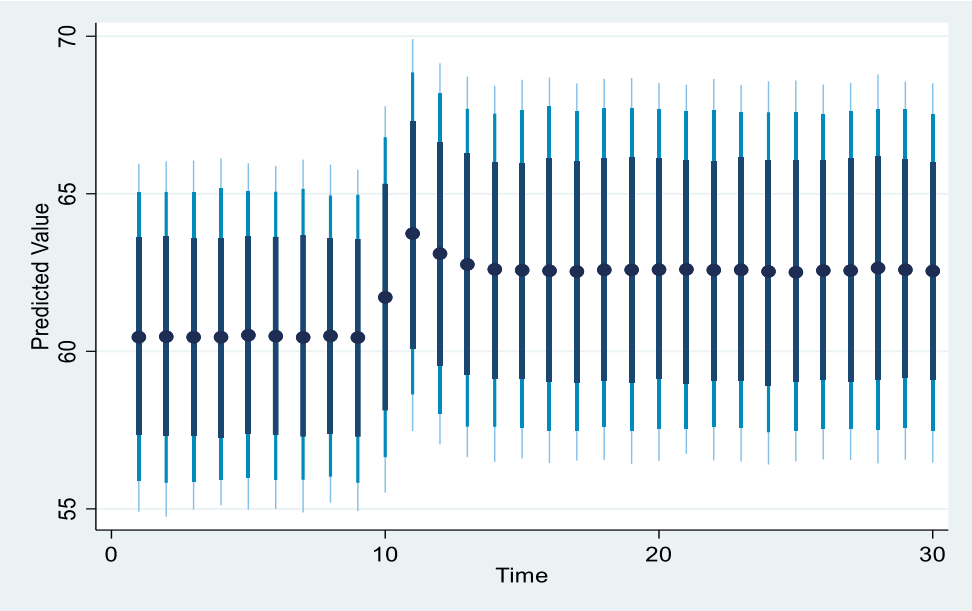

Figure 3: Counterfactual shock in predicted SMEO

The plots in Figure 3 reveals the dynamic ARDL simulations, as it reports that a negative percent (-1%) shock in banks loans to SMEs has not significantly affected small and medium size enterprises (SMEs) output in the short-run from periods 1 to 9; but in the long-run, it sharply increases from period 10 and then stabilized at an increasing rates. Thus, a negative percentage change in banks loans to SMEs through banks reforms in the short-run will not have adverse effect on SMEs output but at long-run, its impact becomes adversely on the SMEs output growth in the economy. From the plots, the black dotted lines showed the predicted SMEs output by -1% shocks in a log-log model, while the coloured regions, and from darkest to lightest indicate the 75, 90, and 95 confidence intervals of the predictions from the model simulated.

Table 8: Estimates of Dynamic ARDL Simulation Model

DARDL	Coeff.	SE	P-Value	Min 95	Max 95
$SMEO_{t-1}$	-.6499198	0.1639581	0.001**	-0.9890929	-0.3107466
$lnBSMEs_{t-1}$	-1.253038	1.040558	0.241	-3.405597	0.8995208
ΔLC	0.173955	0.0416017	0.971	-0.0875787	0.0845406
ΔINF	-0.001519	0.0416017	0.971	-0.0875787	0.0845406
ΔlnEXR	-1.934514	1.719274	0.272	-5.491103	1.622075
Δlnm	3.278515	4.846402	0.505	-6.747032	13.30406
LC_{t-1}	0.6903021	0.2488407	0.011	0.1755359	1.205068
$lnEXR_{t-1}$	-5.594166	1.975569	0.009	-9.680941	-1.507391
$lnm2_{t-1}$	3.616568	1.347087	0.013	.8299059	6.403231
_cons	31.31398	11.29954	0.011	7.939096	54.68887
F > Prob.	**0.0357****	**R^2**	**0.6121**	**Root MSE**	**2.2923**

Source: Computation from Stata 16.0

The results in Table 8 revealed that banks loan to SMEs, inflation rate, exchange rate and broad money supply exert no significant influence on SMEs output in the short-run in Nigeria, while in the long-run, lending cost, exchange rate and broad money supply had significant effect on SMEs output in the economy. According to the model, banks loans to SMEs, lending cost, inflation rate, exchange rate, and broad money supply account for 612 percent of the variations in the SMEs output in Nigeria. The coefficients estimate indicate that a 1 percent shocks in lending cost, and broad money supply are associated with a 0.69 percent and 3.62 percent rises in SMEs on average, respectively, while a 1 percent increase in exchange rate has on average 5.6 percent decrease in SMEs output. Similarly, the study also extracted the fitted values from the regression model to determine how well the model fits the data using KRLS model. The results were compared with those estimated using the KRLS model applied to the same time series data.

Kernel-Based Regularized Least Squares (KRLS) Estimates

Following the estimation of the dynamic ARDL simulation, the Kernel-based Regularized Least Squares (KRLS), which executes pointwise derivatives, was used to determine marginal effects of SMEs output

in the Nigeria's economy. in this sense, the study investigates the structural adjustments in SMEs output growth using empirical estimation via the application of pointwise marginal effects.

Table 9: Pointwise Derivatives using KRLS

SMEO	Avg.	SE	T	P>|t|	P25	P50	P75
lnBSMEs	-2.10459	0.38553	-5.459	0.000	-3.18784	-2.32334	-0.93656
LC	0.127898	0.091139	1.403	0.169	-0.143787	0.029676	0.448727
INF	-0.06618	0.026819	-2.468	0.018	-0.117929	-0.064046	-0.03747
LnEXR	0.062855	0.157273	0.400	0.692	-0.438872	0.259618	0.787269
LnM2	0.300979	0.113635	2.649	0.012	-0.31244	0.32156	0.788007
Diagnostics							
Lambda	0.3342	Sigma	5	R^2	0.8344	Obs	42
Tolerance	0.042	Eff.Df	14.23	Looloss	70.89		

Source: Computation from Stata 16.0

Table 9 unveils the average marginal effects of banks loans to SMEs, lending cost, inflation rate, exchange rate and broad money supply on SMEs output in addition to their standard errors, t-statistics and p-values. Reported also in this results are the 1st quartile, median and 3rd quartile of pointwise marginal effects under P25, P50, and P75 columns. Matching the OLS model based results with the KRLS model results, we observed that the result in KRLS model indicates a significant nexus between banks loans to SMEs and the output growth of the SMEs, with the average marginal effect estimate bigger compared to the ARDL result. This shows that a 1% rise in banks loans to SMEs has a -2.1 percentage point decline in SMEs output on average. Furthermore, inflation rate also has a significant but a decreasing average marginal effect in determining SMEs output, which implies that a percentage points increase in inflation rate has a 0.13% point average marginal decrease in the output of the SMEs. It was also indicated in the estimation that broad money supply has significant average marginal increase effect of 0.301 percentage points, implying that a 1% rise in broad money supply has a 0.3 percentage significant increase in average marginal effect of SMEs output in Nigeria. More so, the study found multiple coefficient determination (R^2) value from KRLS estimate higher, which shows that the explanatory variables account for 83.4 percent of the variations in the SMEs output, while the remaining 16.6 percent is attributable to other SMEs output's determinant excluded from the regression equation.

The accelerated model fit further affirms that the nexus between SMEs financing and SMEs output growth was not characterized by a simple linear relationship as championed by the OLS model. Rather, the nexus is more or less a non-linear model, which the KRLS model appropriately learns the trend of the conditional expectation function of the time series. Also to be noted in this results is the closed-form of the pointwise derivatives considered as an interpretational yardstick as it estimates heterogeneity and summarizes the distribution of the pointwise marginal effects of SMEs output. These results contradict the Schumpeterian financial-led growth hypothesis and financial regression hypothesis framework. The model recognizes the amount of credit to SMEs investment as a critical factor for the growth of small industries in the economy. Further investigation revealed that Nigeria's commercial banks loans condition made it possible for the negative relationship between the SMEs fbank financing and SMEs output. However, the results are in line with the findings of Oladimeji and Adewale (2022), Stefan, Mihai, Alexandra and Liliana (2020) that investigated the impact of small and medium scale enterprises on output growth across countries of the world including Nigeria, Roman , and found that commercial bank loans to SMEs had a significant influence on growth of the economies investigated. The results as well are in accordance with the discoveries of Aladin, Evada, Yuliana and Yuli (2021), Emmanuel and Willie (2021), Amanu (2020), Ceren and Gokhan (2020), Marcelo and Joseph (2019), Adejoh (2021), Etuk, Etuk and Michael (2014), Rasak (2012), Nguyen et al. (2022), Mba and Cletus (2014), Imoisi and Ephraim (2015), Ameh, Alao and Amiya (2020), Iloh and Chioke (2015), Yahaya (2015), Muritala, and Awolaja and Bako (2012) that also researched the influence of SMEs banks credits to SMEs on economic growth across countries of world Indonesia, Nigeria, Ethiopia, Turkey, Brazil, Vietnam, Zimbabwe, Jordan and found that banks credits to SMEs had significant effect on economic growth in the economies.

Table 10: Distribution of the Pointwise Marginal effects of BSMEs

sum d_BSMEs				
	Percentiles	Smallest		
1%	-4.708389	-4.708389		
5%	-4.237411	-4.273033		
10%	-4.026983	-4.237411	Obs	42
25%	-3.187836	-4.094862	Sum of Wgt.	42
50%	-2.323339		Mean	-2.104588

75%	-0.936560	0.410477		
90%	0.0848709	0.4841367	Variance	2.557101
95%	0.4841367	0.9539992	Skewness	0.558758
99%	1.965727	1.965727	Kurtosis	2.613598

Source: Computation from Stata 16.0

From the Table 10, it can be seen that the average pointwise marginal effects of banks loans to SMEs is -2.104588, which is equally the same with the quantities displayed in the KRLS table under the average (Avg.) column. This quantity is akin to the coefficient estimates from the linear regression model and can be interpreted as the average marginal effects. Similarly, the results clearly showed heterogeneity in the marginal effects: at the 1st quartiles, a 1% increase in banks loans to SMEs is associated with -3.2 percentage points decrease in the average marginal effects, whereas at the 3rd quartiles banks loans to SMEs are associated with a -0.94 percentage points fell in the average marginal effects. The median of the marginal effects is -2.3 percentage points decrease. Moving further, one may ask why the marginal effects of the variables vary. To tackle this question, the study plots the marginal effects against levels of banks loans to SMEs. The results are as displayed in Figures 6. They indicate how the marginal effect estimates from KRLS accurately track the derivative of the non-linear conditional nexus.

Lowess Smoother

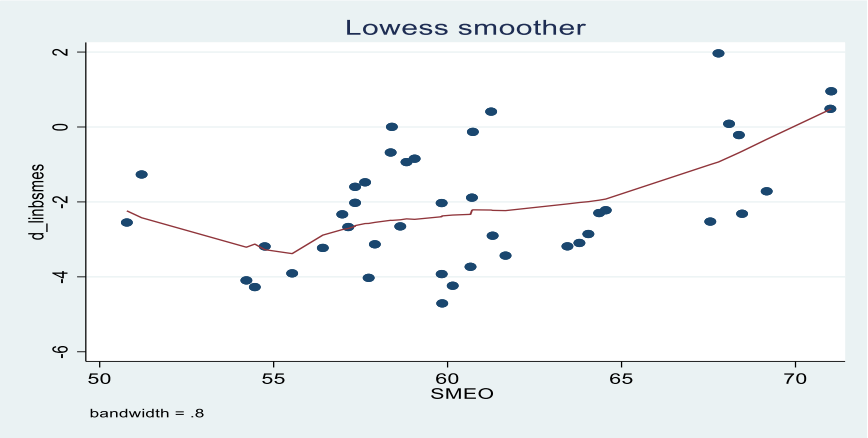

Figure 4: Pointwise marginal effect of BSMEs and SMEO

Having indicated the interpretive benefits of KRLS, this estimation model was carried out to fit in a full model and hence, compares the results estimated through the ARDL with that KRLS in detail. As reported in Figures 4, KRLS was able to provide a flexible fit, improving on both in and out of the sample accuracy.

Policy Implication of the results

From the estimation, the KRLS results showed that banks loans to SMEs had a significant but decreasing average marginal effects on SMEs output, while lending cost indicate significant impact on the output growth of SMEs. More so, the results revealed that inflation rate exert significant but decreasing average marginal effects on SMEs output while broad money supply also showed significant and increasing average marginal influence on the output growth of SMEs. By implication, 1% rise in banks loans to SMEs will decrease average marginal effects of SMEs output by 0.2.1. The negative average marginal effects indicated by the result shows that banks loan conditions in Nigeria are unfavourable to SMEs activities in the country. Similarly, a 1% rise in lending cost will bring about 0.96% increase in the output of the SMEs output, and a 1% increase in broad money supply results in 0.3% increase in the average marginal effect of SMEs output in the economy.

Contribution to Knowledge in Literature

This study contributed to pool of knowledge in literature by applying KRLS model which is based on non-linear model and discovered that the relationship between SMEs financing and output growth of SMEs model is non-linear. The results showed that banks loans to SMEs have significant but decreasing average marginal effects on SMEs output growth while broad money supply had significant and increasing average marginal influence on SMEs outputs. Other studies were silent on average marginal effect of the variables on SMEs outputs.

Policy Recommendations

Since the average marginal effects of Banks loans to SMEs have significant and decreasing average marginal effect on SMEs output in Nigeria, the monetary authorities should restructure commercial banks loan conditions to ensure that it is not too stringent for SMEs operators in accessing loans but should be made more flexible to attract more investors' demand for investment funds. More so, money supply should be increased through purchasing of government bonds by government in the open markets. This will raise quantity of money in circulation and hence, improved SMEs output growth in Nigeria.

V. Conclusion

The study investigated the impact of SMEs financing on SMEs output in Nigeria from 1981 to 2022, using the Autoregressive Distributed Lag (ARDL), the Dynamic ARDL Simulation and Kernel-Based Regularized Least Squares (KRLS) models. The results showed that banks loans to SMEs and inflation rate had significant but decreasing average marginal effects on SMEs output, while broad money supply had significant and increasing average marginal effect on SMEs output in Nigeria. It was also indicated that lending cost had a significant and positive influence on SMEs output, while exchange rates had significant and negative influence on SMEs output in the economy. Thus, knowing that well financed SMEs is very essential for SMEs development and hence, economic growth of Nigeria, this study, well conducted has made its findings and policy recommendations. Thus, it is the conviction of the study that if these recommendations are effectively implemented, it will go a long way in solving the problems of undeveloped SMEs in Nigeria.