

Bank Credit and Nigerian Industrial Performance (2005 – 2024)

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ABSTRACT

Propelled by the need for improved industrial sector in Nigeria, this study examined the effect of bank credit on the industry sector performance in Nigeria from 2000 to 2024. The study adopted Auto Regressive Distributed Lag (ARDL) bounds test estimation technique and dynamic Error correction model (ECM) to test the short run and long run effects of bank credit on the Nigerian industry sector performance. Data on Nigerian Industrial Value-Added IVA (proxy for Nigerian Industrial Performance) served as the dependent variable, while Bank Loans to private sector BLPS, Bank Loans to Federal Government BLFG, and Bank Loans to State Government BLSG, served as the independent variables. The results show that Bank loans and advances to the private sector BLPS has both short run and long run negative significant effects on Nigerian Industry performance. Bank loan to federal government BLFG has no significant short run effect but has significant positive long run effect on Nigerian industry performance. Bank loan to State government BLSG has no significant effect on Nigerian industry performance both in the short run and long run. It was recommended among other things that Nigeria, government, through the central bank of Nigeria should ensure non stringent and investment friendly credit conditions from banks to the private sector industrial firms. Also, bank loans should not be embezzled or used to fund politically motivated projects with not much economic bearing. Federal government bank loans should mainly be channeled to real and industrial sector of the economy to produce the desired positive economic result. Such will enable industrial firms perform optimally and have the desired positive effect significant on industrial sector performance in Nigeria.

Keywords: *Bank Credit, Industrial Performance, Nigeria*

INTRODUCTION

Background of the Study

A key economic goal for Nigeria and similar developing nations is to speed up industrial growth by significantly enhancing industrial funding and its value-added at each step of the value chain (Iwuagwu, 2011) to ensure that their resources are not predominantly sold in their raw form. Industrialization is primarily a factor in prolonged economic prosperity, which clearly results from structural transformation and enhanced capability of the industrial sector to generate and accommodate a suitable workforce, while fostering the growth of other sectors via diverse linkages (Martorano & Sanfilippo, 2017). Nigeria is a British Empire colony and has consistently been dependent on aid for economic enhancement. The nation continues to be on the edge of progress despite the numerous dictates of development theories. Despite the numerous flaws linked to both modernization and dependency theories, Nigeria has maintained vigorous attempts to industrialize and sought to achieve developed nation status (Nduonofit & Emina 2022).

Over the years, bank credit has evolved into a central financing source for industrial activities in Nigeria and globally, making it essential for all sectors of any economy to operate effectively. The quantity of loans and advances provided by commercial banks to different economic entities represents bank credit (Nwagu & Udeagbala 2024). Consequently, lending plays a crucial role in banking activities because of its immediate impact on a country's industrial advancement and business progress (Okwo Eze, & Ugwunta, 2012). Bank lending is a primary income stream for financial institutions. The main goals of banks in offering credit are to enhance profitability, ensure liquidity in the economy, and foster industrial development.

The essential function of banks in funding the Nigerian industries originates from the post-independence period. The industrial sector includes micro, small, medium, and large enterprises involved in agro-based industries, as well as cottage and handicraft activities. Becoming an independent nation in 1960, the Nigerian government initiated several policies and programs, such as the 1974 indigenization decree included in Nigeria's development plans, which aimed to change the country from its mainly agricultural foundation to an industrial economy. The reduction in the industrial sector's contribution to Gross Domestic Product (GDP) is due to multiple reasons, such as policy inconsistencies and reversals, along with infrastructural deterioration and bottlenecks. Additional elements consist of reliance on imported raw material inputs; inadequate foreign exchange revenue; limited consumer support for local products due to a preference for foreign alternatives; double taxation; lack or inefficiency of power generation and difficulty accessing credit (Nwagu & Udeagbala 2024).

Before and after the structural adjustment period, the Central Bank of Nigeria has been observed to take a prominent and catalytic role by employing direct controls not only to regulate overall credit growth but also to decide the share of bank loans and advances allocated to "high priority sectors" and "others." This division of bank credit across sectors is typically intended to boost the productive areas (agriculture, industry, and manufacturing) and subsequently spur greater economic growth in the nation (Asuquo, et. al., 2024). Regrettably, the Financial System Stability Assessment (FSSA) carried out by the IMF in 2002 determined that the financial system in Nigeria was susceptible to various risks, including budgetary mismanagement, the economy's heavy reliance on fluctuating oil prices, and financial exploitation.

The report additionally highlighted that there were significant worries regarding the soundness and stability of Nigeria's banking system (IMF, 2002). The Central Bank of Nigeria (2009) also observed that the credit flow to priority sectors fell short of the set targets and did not positively affect investment, production, and the domestic price level. Indeed, these remarks have raised specific inquiries concerning the robustness, efficiency, and productivity of bank lending within the Nigerian economy.

Given the necessity for ongoing research to enhance the Nigerian industrial sector, this study examines the impact of bank credit on industrial performance in Nigeria. The industrial performance will be represented by the Nigerian industrial value added, while bank credit will be represented by deposit bank credit to Nigeria's private public and industrial sector.

Statement of the Problem

Since the beginning of Nigeria's third republic, it seems that a significant portion of deposit money bank credit is directed towards Nigerian politicians for political endeavors instead of the manufacturing and other productive sectors that are essential for the nation's economic growth and development. This perspective aligns with Soludo's 2007 statement, which emphasized that commercial banks have moved away from their

conventional services and have participated in speculative activities like stock trading and oil ventures, consequently diminishing their credit distribution to productive sectors, including the industrial sector (Nwagu & Udeagbala 2024). The allocation of funds to unproductive areas of the economy has hindered industries in Nigeria from securing capital for new investments or expanding the production capabilities of current industries.

Transforming Nigeria and Africa into industrialized nations is a significant obstacle. The production foundation of West African nations is internationally fragile, marked by outdated equipment and infrastructure, and the West African area is among the most poorly integrated into global value chains (GVCs), especially concerning processing operations, as noted in the 2014 African Economic Outlook. This scenario results from the industrial upheaval that ensued after the removal of tariff barriers in the 1980s, along with the wars and conflicts that took place in various nations throughout the region. The Nigerian Bureau of Statistics (NBS) reports that Nigeria's GDP increased by 3.46% in the 4th quarter of 2023, which is less than the 3.52% registered in the same quarter of 2022. The industry's growth rate reached 3.86%, an enhancement from the -0.945 noted in the fourth quarter of 2022. In 2023, GDP increased by 2.74% compared to 3.10% in 2022. (Aro, 2024).

Once more, in the last thirty years, Nigeria's industrial sector has been sidelined because of the nation's reliance on crude oil. In spite of the country's vast human and natural resources, the manufacturing industry has been in a miserable condition, contributing only a minimal share to the gross domestic product. Lack of financial resources to purchase modern industrial manufacturing machinery, obtain foreign raw materials, implement information technology systems, and hire skilled personnel have severely limited the industry; addressing the funding issue with sufficient credit could have reduced production costs, increased productivity, and enhanced competitiveness (Nwagu & Udeagbala 2024).

In light of these disappointing conditions in the Nigerian industrial sector, this research aims to analyze the impact of bank credit on the performance of Nigerian industries. This will add to the expanding understanding of the performance of the Nigerian industrial sector.

Objectives of the Study

The main objective is to determine the effect of bank credit on the Nigerian industrial performance. The specific objectives are to:

1. determine the effect of bank loans and advances to private sector by Nigerian deposit money banks on the industrial value added in Nigeria
2. ascertain the effect of bank loans and advances to federal government by Nigerian deposit money banks on the industrial value added in Nigeria
3. determine the effect of bank loans and advances to state government by Nigerian deposit money banks on the industrial value added in Nigeria

Research Questions

The following research questions have been formulated to guide the study:

1. What is the effect of bank loans and advances to private sector by Nigerian deposit money banks on the industrial value added in Nigeria?
2. How has bank loans and advances to federal government by Nigerian deposit money banks affected the industrial value added in Nigeria?

3. To what extent is the effect of bank loans and advances to state government by Nigerian deposit money banks on the industrial value added in Nigeria?

Research Hypotheses

In line with the research questions and objectives, we formulate the following research null hypotheses:

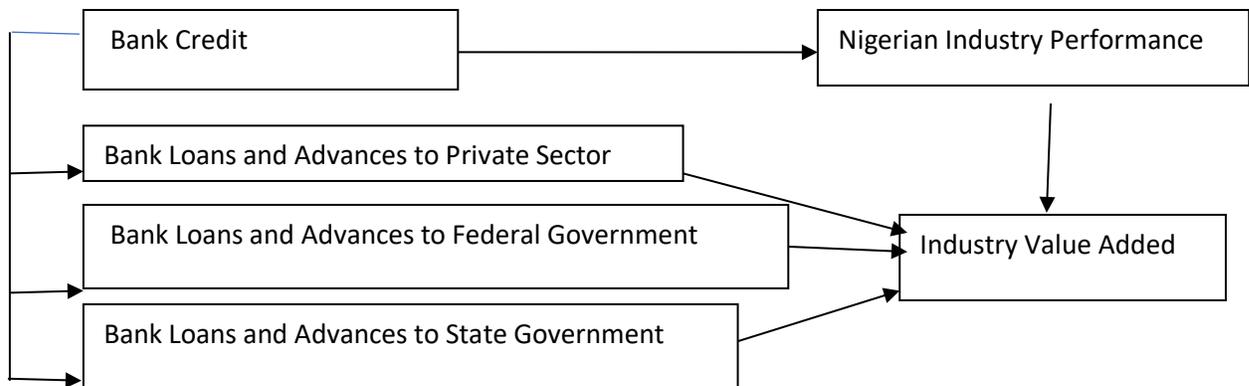
1. Bank loans and advances to private sector by Nigerian deposit money banks has no significant effect on the industrial value added in Nigeria.
2. Bank loans and advances to federal government by Nigerian deposit money banks has no significant effect on the industrial value added in Nigeria,
3. Bank loans and advances to state government by Nigerian deposit money banks has no significant effect on the industrial value added in Nigeria.

REVIEW OF RELATED LITERATURE

Conceptual Review

Operational Conceptual Framework

The expected relationship between our research variables is direct relationship between the dependent variable, Industrial Value Added and the independent variables, Bank credit. It can be illustrated diagrammatically thus:



The concept of bank credit

Credit involves the provision of funds from the lender to the borrower. Ajayi (2000) asserts that credit signifies a commitment from one party to compensate another for funds obtained or for goods and services acquired. Credit is closely linked to the banking sector, as banks act as a channel for funds obtained from the surplus units of the economy in the form of deposits and then allocate these to the deficit units that require funds for productive activities. Consequently, banks owe money to the depositors of funds and are owed money by the borrowers of funds.

As per CBN (2003), the volume of loans and advances provided by the banking sector to economic agents represents bank credit. Credit is frequently secured with collateral that aids in guaranteeing loan repayment if there is a default. Consequently, access to credit enables the function of intermediation to occur, which is crucial for economic growth.

The concept of industrial sector

The oxford dictionary of economics describes industrialization as the transition of resources from primary production to completed goods. Industrialization represents the shift from a predominantly agricultural

economy with employment possibilities to a more significant economic system wherein the production of goods and services is largely mechanized (Nduonofit & Emina 2022). In other terms, it signifies the transition and substitution of personal manual labor and craftsmanship with a mechanized mass production system and an assembly line approach. Evidently, post-colonial Nigeria and West Africa represented a desperate attempt to liberate the nation from the constraints of underdevelopment and advance her into the realm of progress (becoming industrialized).

Nigeria's indigenization policy

A significant push for industrialization by Nigeria focused on indigenization. The indigenization policy was strengthened by the proclamation of the Enterprise Promotion Decree in 1972, which was later supplemented in 1973, 1974, and 1977. The indigenization policy served as a framework to ethnicize the Nigerian economy and enhance Nigerian participation. The economic plan divided all entities into two schemes and provided Nigerians with specific protection in rice milling, printing, and publishing. This indicates that all sectors in the previously mentioned areas must be staffed solely by Nigerians. There were also establishments available for foreigners or 'aliens' to engage in, but with indigenous equity ensuring a fair participation of 40%. In 1977, the policy was revised again, raising local fair participation to 60% for Nigerians and 40% for non-Nigerians (Akpakpan, 1987).

The concept of manufacturing sector

Manufacturing companies serve as drivers for industrial and economic growth. They also engage actively in global trade and foreign currency revenues. Consequently, most nations promote investments in various sectors. In this research, manufacturing industries and Small and Medium Scale Enterprises will be utilized interchangeably, as Nigeria's manufacturing sub-sector encompasses a broad array of industrial activities, including large, medium, and small-scale manufacturing businesses. Considering the significant role of the manufacturing sector in national development, numerous studies have evaluated the sector's performance in relation to the diverse policies and initiatives implemented to encourage its growth (Ebi & Emmanuel, 2014).

The manufacturing industry in Nigeria has grown significantly since the 1960s. Nevertheless, the industry has not yet significantly influenced the economic structure through its contributions to GDP, job creation, foreign exchange revenues, and fostering effective connections between different economic sectors. The industry remains predominantly influenced by consumer products, light manufacturing, and individual ownership businesses. The creation of capital or intermediate products remains fairly minimal. The primary manufactured products include beverages, textiles, wood and furniture, cement and cement items, chemicals, plastics, footwear, tobacco, and petroleum products. The previous pattern of the manufacturing sector developed from Nigeria's industrialization strategy that focused mainly on an import substitution approach, aiming to produce certain finished goods locally that were previously imported (Ojo, 1975). Consequently, the focus of industrial policy encompassed protective actions (enforcement of tariffs and import permits) to shield domestic industries and foster new ones; significant dependence on importing raw materials and capital goods; and offering a range of industrial incentives.

Theoretical Review

The loanable fund theory

The loanable funds theory suggests that the investment funds demand curve declines, indicating that fewer funds are borrowed at higher interest rates and more funds at lower rates. The theory proposed that banks cannot consistently impose high interest rates, for instance, seeking to achieve the highest interest revenue

(Stiglitz & Weiss, 1981). If banks set their interest rates too high, it can lead to adverse selection issues since high-risk borrowers may agree to these elevated rates. After obtaining the loans, these borrowers might adopt a moral hazard mindset, often referred to as borrower moral hazard, as they are prone to engage in significantly risky projects or investments (Chodechai, 2004). The signaling theory proposes that borrowing companies ought to offer more collateral to indicate to banks that they are less risky borrowers, allowing them to receive lower interest rates. Borrowers providing less collateral for their loans signify greater levels of risk. Companies providing greater collateral will receive lower interest rates, whereas those presenting minimal collateral will face higher interest rates (Chodechai, 2004).

Financial repression hypothesis

This hypothesis is based on the implementation of controlled or synthetic limits on interest rates; credit limits; distribution of credits across sectors; rationing of credit; and government-directed credit initiatives in developing nations to foster economic growth. The theory of financial repression contradicts the use of market forces for resource allocation within a market economy. Challenging the repression hypothesis, Gemech and Struthers (2003) argue that in a financially repressed economy, not only are savings and investment low and irregular, but the conducted activities are also of inferior quality. They also proposed that if interest rates are obstructed from balancing money and credit markets, the general amount and quality of savings and investment are curtailed.

In a realistically imperfect economy, information is expensive and significantly flawed, thus credit distribution is affected by information asymmetries and the costs associated with monitoring and verifying transactions. Due to information imbalances that cause issues like adverse selection, moral hazard, free riding, and uncertainty regarding project returns, government intervention in credit distribution is warranted. Similarly, in instances where commercial banks show little interest in funding risky projects with extended payback periods despite the potential for greater overall returns; banks hesitate to finance lucrative, innovative, and productive small businesses lacking sufficient collateral; thus, government intervention in credit distribution becomes necessary. A further compelling argument for government participation in the distribution of credit and other financial repression tools is based on the notion that the government possesses better information and a comparative edge in resources, enabling lower costs of contract enforcement through taxation and policy authority to facilitate a more effective industrial strategy that guides economic growth.

Stiglitz (1994) reinforces the financial repression hypothesis through directed credits aimed at lucrative export-oriented sectors, arguing that the hypothesis has proven effective in nations that established long-term credit banks focused on offering long-term investment funds for agricultural and industrial projects, thereby addressing credit gaps caused by commercial banks that primarily provide short-term loans. Critics of the theory argue that it is antimarket; unbalanced; hampers efficient resource allocation; diminishes savings and capital accumulation, while McKinnon-Shaw's financial liberalization theory is preferred due to its benefits of drawing global savings from international capital markets to their optimal uses regardless of location; promoting transparency and accountability; and minimizing adverse selection, moral hazard, and liquidity constraints in financial markets, Obstfeld, 1998; Mishkin, 2001; Gemech, 2003. The limitations of the repression hypothesis noted by critics consist of rent-seeking behaviors, corruption, resource diversion, and the displacement of resources that could be beneficially utilized by private enterprises, along with increased severe market distortions that hinder growth and development.

Financial liberalization hypothesis

The theory of financial liberalization was established by McKinnon (1973) and Shaw (1973) in response to the theory of financial repression, which is viewed as opposing market forces in distributing credit to the economy. Proponents of the hypothesis argue that artificial caps on interest rates imposed by developing nations often result in decreased savings, reduced capital accumulation, and generate disincentives for efficient resource allocation. The pair claimed that the unrestricted interaction of market forces establishes the correct pricing of financial resources, thus encouraging savings and investment. The hypothesis is based on the assumption that interest rates affect savings, and as savings increase, a greater level of investment is supported, which ultimately results in economic growth. According to advocates of the theory, financial liberalization is comparable to elevated savings rates and a greater degree of investment and growth.

Backing the hypothesis, Gemech and Struthers (2003), Stulz (1999), and Mishkin (2001) argue that financial liberalization enhances the operation of financial systems; raises fund availability and allows for cross-country risk diversifications; however, it mitigates adverse selection and moral hazard; promotes transparency and accountability, while minimizing liquidity issues in financial markets and ensures that financial resources are directed to their most efficient uses regardless of the country's needs.

Consequently, the theory despite its many supporters has its detractors. It is suggested that despite the advantages of financial liberalization, the concept is harmful to nations with weak corporate governance and limited legal safeguards. Certain opponents of the theory suggest that financial liberalization causes macroeconomic instability in various nations. In his comparison regarding the flaws of the theory, Diaz-Alejandro (1985) argues that to alleviate financial repression in Latin American economies in the 1970s, the financial sector was liberalized. resulted in crises that caused a complete failure of institutions and reduced domestic savings.

Stages of growth theory of industrialization

This concept is linked to the writings of W.W. Rostow (1960). It is commonly known as the modernization theory. It clearly mentions that for nations to attain industrial progress or industrialization, they must progress through five stages of growth which are:

The traditional society:

The traditional society stage is primarily marked by a subsistence, agriculture-driven economy, coupled with labor-intensive work and minimal trading activities, along with a population that does not possess a scientific view of the world and technology.

The preconditions for take-off

At this point, a society starts to establish manufacturing, adopting a broader national/international perspective.

The take-off

Rostow indicates that this phase is a brief duration of rapid growth, during which industrialization starts to take place, and workers along with institutions gather around a emerging industry. (www.thoughtco.com).

The drive to maturity and the age of high mass-consumption:

Western nations like the United States are in this final stage of development. This is where a nation's economy thrives in a capitalist framework, primarily defined by large-scale production and consumption, evident in many of the world's developed nations.

Rostow's perspective indicates that once a nation has successfully navigated these five stages, it has achieved industrialization (Nduonofit & Emina, 2022).

Classical theories of industrialization

The initial category is the Classical Theories of Industrialization, featuring input from the Mercantilists, Adam Smith, and Max Weber. Mercantilism emerged as the feudal system began to decline. It represented a shift from the farming system to a different economic foundation. Essentially, it emerged due to the impact of new knowledge acquired by humans within society, which Mokyr (2003) refers to as "the Industrial Enlightenment." During the early 16th century, the inclination of many nations, particularly European ones, was focused on expanding and fortifying their economies to counter those of other nations. The approach at that time was to engage in providing services for private enterprises or private investigations. The term mercantilism originates from the Latin word – *mercāns*, which typically signifies buyer. In other terms, mercantilists were purchasers who journeyed extensively seeking opportunities. The mercantilist thought that wealth was inherently limited, so it is essential for a country or nation to find and obtain that wealth. Hayes (2021) argues that the theory of mercantilism emphasized that countries ought to sell their products to other nations while receiving no purchases in exchange. In other words, enhancing the export of domestic products instead of allowing imports from abroad. Thus, mercantilism can be seen as an economic framework that believes a government can achieve national prosperity by regulating trade and employing tariffs and other protective strategies to ensure that exports exceed imports. In essence, this means that a nation seeks to sell more products than it has purchased from other nations. For instance, England needed export markets to expand its developing cotton textile sector but faced a lack of land to cultivate raw cotton (Nduonofit & Emina, 2022).

Theoretical Framework or anchor theory

This research is based on the Loanable funds' theory. The loanable funds theory suggests that the investment funds demand curve is downward sloping, indicating that fewer funds are borrowed at higher rates, and more are borrowed at lower interest rates. The theory asserted that banks are not able to consistently impose high interest rates, for instance, seeking to maximize interest revenue (Stiglitz & Weiss, 1981). If banks set interest rates too high, it can lead to adverse selection issues since high-risk borrowers are inclined to agree to these elevated rates. After obtaining the loans, these borrowers might exhibit a moral hazard mindset, often referred to as borrower moral hazard, as they tend to engage in very risky projects or investments (Chodechai, 2004). The signaling theory indicates that firms seeking loans ought to offer increased collateral to convey to banks that they are lower-risk borrowers, thereby securing lower interest rates. Borrowers providing minimal collateral for their loans show elevated risk levels. Companies providing greater collateral will consequently receive lower interest rates, while those offering minimal collateral will incur higher interest rates (Chodechai, 2004).

This theory highlights the importance of bank credit for investment in the industrial sector to achieve improved economic outcomes. It stresses the importance of banks lowering credit costs to enhance access to bank financing for investments in the industrial sector.

Empirical Review

The research by Nwagu and Udeagbala (2024) examined how bank lending to the private sector impacts the performance of Nigeria's manufacturing sector from 1981 to 2021. Data were obtained from the statistical bulletin of the Central Bank of Nigeria and the National Bureau of Statistics for several years. The Autoregressive Distributed Lag (ARDL) technique was utilized. Augmented Dickey-Fuller (ADF) tests for

stationarity indicated that the variables were integrated at the first level, while ARDL Bound tests confirmed a cointegration relationship among the variables. The findings indicated that the exchange rate exhibited a positive coefficient and significantly influenced manufacturing output in Nigeria throughout the study period, whereas other explanatory variables such as private sector credit and interest rates had no statistical significance on manufacturing GDP during the time of the study. Based on the results, the researcher advises that the Central Bank of Nigeria, being the apex bank, should enhance the use of moral suasion in addition to employing both direct and indirect controls to motivate banks to continue supporting the sector as the government seeks to diversify the economy's revenue sources.

Okon, Twaliwi, & Ndubuisi (2022) conducted an empirical analysis of how credit from commercial banks to the industrial sector affects Nigeria's economic growth. The estimation was conducted using the Autoregressive Distributed Lag (ARDL) method. A key result is that a strong connection is present between the credit of Nigeria's commercial banks and economic growth. The research additionally showed that in the majority of the models, the critical explanatory variables for commercial banks' credit were statistically insignificant, which was contrary to prior expectations. Based on these results, the research concludes that the effect of commercial banks' loans to the industrial sector of the economy is varied and mostly insignificant in Nigeria. According to the findings, the study advises that to oversee commercial banks' lending to the industrial sector, funding should be provided to registered agriculturists and industrialists based on proven track records of real sector output, aiming to significantly diminish, if not eliminate, misapplication and misappropriation.

Nwabuisi, Oke-Bello, Oyewole, Toriola, Folami, & Afolabi, (2020) examines the impact of bank loans on the performance of the manufacturing sector in Nigeria. The research employed an ex post facto design and developed an econometric model where manufacturing output serves as the dependent variable, while bank credit, interest rate, and exchange rate function as the independent variables. Annual time series data spanning from 1981 to 2017 was obtained from the Central Bank of Nigeria Statistical Bulletin and analyzed through the dynamic ordinary least squares (DOLS) method. The research indicated that bank credit and interest rates had a notable positive impact on the performance of the manufacturing sector, whereas the exchange rate exerted a significant negative effect on manufacturing sector performance in Nigeria.

Chukwunweike (2019) aimed to assess how economic growth responds to bank credit in Nigeria, focusing particularly on the agricultural and industrial sectors. The research utilized an ex-post facto research design alongside ordinary least squares regression, employing annualized time series data over a 36-year span from 1981 to 2016, which was gathered from the statistical bulletins of the central bank of Nigeria. It was found that bank credit has a positive and significant impact on the productivity of both the agricultural and manufacturing sectors. Consequently, it is suggested that effective policies be established in enhancing the macroeconomic and regulatory framework, as this would not only stabilize the financial system but also boost banks' ability to provide credit, thereby promoting sectoral growth and productivity.

Ogunmuyiwa Okuneye, & Amaefule (2017) investigated how bank credit affects the growth of Nigeria's manufacturing sector. Time series data from the transition to democratic governance in 1999 through 2014 were applied to the regression model utilizing econometric methods, specifically the Augmented Dickey-Fuller (ADF) test and the Autoregressive Distributed Lag (ARDL) model. Empirical evidence indicates that bank loans to the private sector positively affect the manufacturing industry. Therefore, they suggested that monetary policy tools should continue to focus on directing additional credits to the private sector to

completely realize the intended goals of enhancing the sector's output and facilitating the achievement of the desired economic growth and development.

Aniekan and Sikiru (2010) analyzed the connection between banking sector loans and economic development in Nigeria during the years 1970-2008. The Granger causality test was employed to establish the causal links between the pairs of variables of interest, while regression models utilized a Two-Stage Least Squares (TSLS) estimation technique. The Granger causality test results indicate a unidirectional causal link from GDP to private sector credit (PSC) and from the industrial production index (IND) to GDP. Regression model estimates suggest that private sector credit has a positive effect on economic growth during the timeframe examined in this research. Nonetheless, the interest rate on loans hinders economic growth. Furthermore, the paper suggests enhancing financial market development that supports increased credit to the private sector at lower interest rates to encourage economic growth.

Mukhopadhyay and Pradhan (2010) investigated the causal link between financial development and economic growth in seven Asian developing nations (Thailand, Indonesia, Malaysia, the Philippines, China, India, and Singapore) over the past 30 years, employing a multivariate VAR model. The research determined that a universal agreement regarding the finance-growth relationship in developing nations cannot be reached. Similarly, Shan & Jianhong (2006) utilized a Vector Autoregression (VAR) method to investigate how financial development affects economic growth in China. They discovered that financial development ranks as the second factor, following labor input's contribution, in driving economic growth in China. Their research backs the perspective found in the literature that economic growth and financial development show a reciprocal causality, thus opposing the so-called "finance-led growth" theory.

Dey and Flasherty (2005) employed a two-step regression model to investigate how bank credit and stock market liquidity influence GDP growth. They discovered that credit from banks and the stock market Liquidity is not a reliable factor in determining GDP growth. The advancement of banking was discovered to be a a major factor in GDP growth, whereas turnover is not.

Koivu (2002) examines the relationship between finance and growth utilizing a fixed-effect panel model and a balanced panel dataset from 25 transitioning countries from 1993 to 2000. His findings indicate that the interest rate margin had a significant and negative correlation with economic growth. Additionally, an increase in credit appeared not to hasten economic expansion. According to the results, he determines that the rise in credit has not consistently been sustainable, and, in certain instances, it might have resulted in a reduction in growth rate.

Limitations of Previous Studies

Most of the empirical studies examined focused on the impact of bank credit on Nigeria's economic growth. Those who examined the industrial sector focused solely on manufacturing, neglecting the industrial value added in Nigeria's economy. This research will address this gap by assessing the impact of bank credit on industrial value added in Nigeria. This will provide further insight into how access to bank credit has enhanced the value added of Nigeria's industrial sector.

METHODOLOGY

Research Design

The research design adopted for this study is the ex-post facto research design. This design is considered appropriate because the study relies on secondary data derived from historical records of macroeconomic

variables such as private consumption expenditure, interest rates, and banking sector credit in Nigeria. An ex-post facto research design allows researchers to investigate cause-and-effect relationships where the independent variables cannot be manipulated due to their occurrence in the past. It is also the most suitable approach for studies involving macroeconomic time series, as it permits a longitudinal investigation into the dynamics of economic indicators over time.

Sources and Methods of Data Collection

Data were sourced from Central Bank of Nigeria (CBN) Statistical Bulletins except the Industry value added sourced from World bank publications.

Methods of Data Collection:

This study is based entirely on secondary data covering the period 2005 to 2024.

Model Specification

To empirically examine the effect of bank credit on the performance of Nigerian industrial sector, this study adopts the Autoregressive Distributed Lag (ARDL) Bounds Testing Approach to Cointegration. This approach is particularly suitable because: It accommodates small sample size like our study sample size of twenty observations. It permits variables to be integrated at different levels (I(0) and I(1)), provided none is I(2). It also simultaneously estimates short-run dynamics and long-run equilibrium relationships.

The functional form of the model is expressed as:

$$NIVA = f(BLAP, BLAF, BLAS, BLAL)$$

Where: NIVA = Nigerian industry value added

BLAP = Bank Loans and Advances to private sector by Nigerian Deposit Money Banks.

BLAF = Bank Loans and Advances to federal government by Nigerian Deposit Money Banks.

BLAS = Bank Loans and Advances to state government by Nigerian Deposit Money Banks.

We specified generalized form of ARDL model to capture our objective as thus:

$$NIVA_t = \psi_0 + \sum_{j=1}^p \beta_j NIVA_{t-j} + \sum_{i=0}^q \alpha_i BLAP_{t-i} + \sum_{m=0}^q \theta_m BLAF_{t-m} + \sum_{n=0}^q \sigma_p BLAS_{t-p} + \varepsilon_t$$

Where ψ_0 is the constant while $\beta_j, \alpha_i, \theta_m,$ and σ_p represents model parameters to be estimated with ε_t as the error term and t = Time period (1994–2023)

Our bounds-test outcome indicates the presence cointegration among variables in the model. Thus the ARDL model was transform to Error Correction Model (ECM) which we specified as follows:

$$\Delta NIVA_t = \Phi ECT_{t-1} + \sum_{j=1}^p \beta_j NIVA_{t-j} + \sum_{i=0}^q \alpha_i \Delta BLAP_{t-i} + \sum_{m=0}^q \theta_m \Delta BLAF_{t-m} + \sum_{n=0}^q \sigma_p \Delta BLAS_{t-p} + \varepsilon_t$$

Where: Δ is a first difference operator.

Φ = speed of adjustment to equilibrium parameter

Justification for the Model

The choice of the ARDL model is justified based on its flexibility in handling variables with mixed integration orders and its ability to produce reliable estimates in small sample scenarios like ours.

Additionally, it provides both short-run and long-run estimates simultaneously, making it ideal for economic policy-related research.

Methods of Data Analysis

The data analysis procedure follows a systematic econometric methodology comprising the following stages:

Unit Root Tests

Before conducting ARDL, it is essential to test the stationarity properties of the variables using: Augmented Dickey-Fuller (ADF) test. This ensures that none of the variables is integrated of order two [I(2)], which would invalidate the ARDL approach (Pesaran et al., 2001).

ARDL Bounds Test for Cointegration

This test is applied to establish whether a long-run equilibrium relationship exists among the variables. The null hypothesis of no cointegration is tested against the alternative of the presence of cointegration using critical values.

ARDL model estimation

The ARDL model is estimated based on the optimal lag length determined by Akaike Information Criterion (AIC). Both short-run dynamic coefficients and long-run equilibrium parameters are extracted from the estimated model.

Error correction model (ECM)

If cointegration exists, an ECM is derived from the ARDL model to capture the speed at which deviations from the long-run equilibrium adjust back to equilibrium.

Diagnostic tests

The following diagnostic tests will be conducted to validate the robustness of the model:

- Serial Correlation Test using Breusch-Godfrey LM test.
- Heteroskedasticity Test using White's or Breusch-Pagan test.

These tests ensure that the estimated model is free from econometric problems such as autocorrelation, and heteroskedasticity.

DATA PRESENTATION AND ANALYSIS OF RESULTS

Data Presentation

The annual time series data on Nigerian Industry Value Added (IVA), Bank Loans and Advances to private sector (BLPS), Bank Loans and Advances to Federal Government (BLFG) Bank Loans and Advances to private sector (BLSG) used for the research are presented in the appendix I.

Analysis of Results

Stationarity Test

All research variables presented in section 4.1 above were subjected to unit root test using Augmented Dickey Fuller (ADF) to test for their stationarity and order of integration. The results obtained were summarized in table 1 as follows:

Table 1 Unit Root Test Results

Variable	Level Form		First Differencing		Order of Integration
	ADF	5% Critical Value	ADF	5% Critical Value	
IVA	-2.565163	-3.004861	-3.807785	-3.004861	I[1]
BLPS	-1.070311	-2.991878	-3.385781	-2.998064	I[1]
BLFG	-2.663867	-2.991878	-4.990656	-2.998064	I[1]
BLSG	-0.288989	-2.991878	-4.182966	-2.998064	I[1]

Source: E-views Result

From the result in Table 1, the ADF statistics of all the variables were not stationary at level form as their ADF values were less than their respective critical values at 5% level of significance. It means that the movements of all the variables are not predictable at level form and are not good for economic forecasting. The nonstationary variables at level form became stationary at first differencing which implies that they are integrated of order one I (1). With all the variables integrated of order 1, the ARDL process and model is appropriate for the study. See the appendix for detailed result of unit root test conducted.

ARDL Bounds Test Analysis

The summery result of the bound test is contained in table 4.2 thus:

Table 2: ARDL Bounds Test Result

F Statistic 6.576134			
Critical Value Bounds			
Significance	I(0) Bound	I(1) Bound	Decision
10%	2.37	3.2	Co integrated
5%	2.79	3.67	Co integrated
2.5%	3.15	4.08	Co integrated
1%	3.65	4.66	Co integrated

The bounds test result shown in table 1, indicates that F statistic is higher than critical values of the upper bound I (1). Thus, the research variables are cointegrated and hence we estimated long run error correction model and analyzed both short run and long run effects of Bank credit on industry sector performance in Nigeria.

ARDL Short Run, Co integration and Long Run Empirical Results

Summary of ARDL Short Run, Co integration And Long Run Empirical Results is contained in table 3 thus:

Table 3: Summary of ARDL Short Run, Co integration and Long Run Estimates

Dependent Variable: D(IVA)				
Co integrating Form				
Variable	Coefficients	Std. Error	t - Statistic	Prob
BLPS	-0.000799	0.000344	-2.326067	0.0368
BLFG	0.015436	0.017317	0.891358	0.891358
BLSG	0.004487	0.004079	1.099985	0.2913
CointEq(-1)	-0.833342	0.152348	-5.469998	0.0001
Long Run Coefficients				
Variable	Coefficients	Std. Error	t - Statistic	Prob
BLPS	-0.000959	0.000306	-3.133276	0.0079
BLFG	0.126952	0.034541	3.675416	0.0028
BLSG	0.010585	0.004924	2.149952	0.0610
C	26.20224	1.203191	21.77729	0.0000

The results in table 3 show that bank loans and advances to the private sector BLPS has both short run and long run negative significant effect on Nigerian Industrial Value-Added IVA in Nigeria within the period studied at 5% level of significance. Such is indicated with its short run and long run probability values 0.0368 and 0.0079 less than 0.05 respectively. Its short run coefficient indicates that a unit increase in BLPS will decrease Nigerian Industrial Value-Added IVA or Nigerian industry performance by 0.000799 units in Nigeria in the short run. The long run coefficient indicates that a unit increase in BLPS will decrease Nigerian Industrial Value-Added IVA or Nigerian industry performance by 0.000959 unit in Nigeria in the short run.

Bank loan to federal government BLFG has no significant short run effect but has significant positive long run effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance at 5% level of significance with probability 0.0028 less than 0.05. Its long run coefficient indicates that a unit increase in BLFG will increase Nigerian Industrial Value-Added IVA by 0.126952 unit in Nigeria in the long run.

Bank loan to State government sector BLSG has no significant effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance at 5% level of significance both in the short run and long run. Such is indicated with its short run and long run probability values 0.2913 and 0.0610 all greater than 0.05 respectively. Hence there is no need to analyze its coefficients for the study both in the short run and long run. The co-integrating equation of the has a negative sign as appropriate and a coefficient of -0.833342 with a p-value of 0.0001. This implies that about 83.3342% of every movement into disequilibrium is

corrected for within one period and the p-value indicates that the coefficient is highly significant at 5% level of significance since it is far below 0.05.

Post Estimation Tests

Serial Correlation LM test

We used Breusch – Godfrey Serial Correlation LM test to check for serial Correlation in error term of our model. The full result is in appendix 6, while the summary is as shown in table 4.4 thus:

Table 4: Breusch – Godfrey Serial Correlation LM test

F-statistic	2.796261	Prob. F(2,11)	0.1043
Obs*R-squared	7.415116	Prob. Chi-Square(2)	0.0245

SOURCE: E-views Result and Author’s Tabulation

Table 4, show that the probability of the F-statistics which 0.1043 exceeds 0.05 (5%). Hence, we conclude that the model has no serial correlation at 5% significance level.

Heteroskedasticity Test

To ensure a Homoskedastic model, indicating constant error term over time, we tested for Heteroskedasticity using Breusch-Pagan-Godfrey heteroskedasticity test. The full result is in appendix 7, while the summary outcome is as shown in table 5 thus:

Table 5: Breusch - Pagan – Godfrey Heteroskedasticity Test

F-statistic	0.506770	Prob. F(8,13)	0.8308
Obs*R-squared	5.229897	Prob. Chi-Square(8)	0.7327
Scaled explained SS	1.308541	Prob. Chi-Square(8)	0.9954

SOURCE: E-views Result and Author’s Tabulation

Table 5 show that the Obs*R-square probability value (0.7327) exceeds 0.05. This implies that the variance of the error term is constant over time. Hence, we conclude that our model is Homoscedastic at 5% significance level.

Test of Hypothesis

Given our ARDL results in sub section above, we made the following probability analysis for hypothesis tests of our study variables:

The Short run probability value of BLPS, 0.0368 shows significant effect at 5% level of significance since it is less than 0.05. Similarly, the long run probability value, 0.0079 is also significant at 5% level of significance. Hence, we reject null hypothesis 1 H01 and conclude that bank loans to private sector BLPS have both short run and long run significant negative effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance at 5% level of significance.

Short run probability value of BLFG, 0.891358 shows insignificant effect at 5% level of significance since it is greater than 0.05. But the long run probability value, 0.0028 is significant at 5% level of significance. Hence, we reject null hypothesis 2 H02 and conclude that bank loans to federal government sector BLFG has long run significant negative effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance at 5% level of significance.

The probability value of BLSG is 0.2913 in short run and 0.0610 in the long run and both are insignificant at 5% level of significance as they are greater than 0.05. Hence, we accept null hypothesis 3 H03 and conclude that Bank Loans and Advances to state government sector has no significant effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance at 5% level of significance.

Discussion of Findings

Our estimation and analysis above have shown that bank loans to private sector BLPS have both short run and long run significant negative effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance. This is not in conformity with a priori expectation that bank credit should have significant positive effect on Nigerian industry performance. This may be as result of stringent and investment unfriendly credit conditions from banks to the private sector industrial firms. Economies of developed economies of the world like that of the United States of America. Hence, access to credit by private firms in industrial sector cannot be over emphasized. But conditions for such credits should be fair enough to enable the firms perform optimally and have the desired positive effect on industrial sector performance in Nigeria.

Our findings indicate that bank loans to federal government sector BLFG has insignificant short run effect and long run significant positive effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance. This conforms to a priori expectation that government loans channeled to real and industrial sector of the economy will produce positive result. Government adequate funding of industrial sector cannot be over emphasized for Nigeria to achieve adequate industrialization that enables full employment, economic expansion and development.

The findings also indicate Bank Loans and Advances to state government sector has no significant effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance. This does not conform to a priori expectation. It indicates state government bank loans are not really utilized to fund the real and industrial sector of Nigerian economy. Most of the loans may have been partly embezzled and partly used to fund political projects with no much economic bearing.

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

Summary of Findings

We looked at the effect bank credit on Nigerian industrial performance. Nigerian Industrial Value-Added IVA (proxy for Nigerian Industrial Performance) served as the dependent variable, while selected bank credit components: Bank Loans to private sector BLPS, Bank Loans to federal government sector BLFG, and Bank Loans to State Government Sector BLSG, served as the key independent variables. Our findings can be summarized as follow:

1. Bank loans and advances to the private sector BLPS have both short run and long run negative significant effect on Nigerian Industrial Value-Added IVA in Nigeria

2. Bank loan to federal government BLFG has no significant short run effect but has significant positive long run effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance.
3. Bank loan to State government sector BLSG has no significant effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance both in the short run and long run.

Conclusion

We have been able to estimate and analyze the effect of bank credit on Nigerian industrial performance using selected bank credit components. We expect that Nigerian stakeholders and policy makers will see our research outcome as good tool for economic monitoring and management, especially in the industrial sector of the economy.

Recommendations

Following our research findings, we make the following recommendations:

1. Since Bank loans and advances to the private sector BLPS has both short run and long run negative significant effect on Nigerian Industrial Value-Added IVA in Nigeria, government through the central bank of Nigeria should ensure non stringent and investment friendly credit conditions from banks to the private sector industrial firms. Such will enable the firms perform optimally and have the desired positive effect on industrial sector performance in Nigeria.
2. Since Bank loan to federal government BLFG has no significant short run effect but has significant positive long run effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance, federal government bank loans should mainly be channeled to real and industrial sector of the economy to produce the desired positive economic result. Federal government bank Loans should not be used for politically motivated less priority issues like renovation of government offices, political allowances and their likes.
3. Since Bank loan to State government sector BLSG has no significant effect on Nigerian Industrial Value-Added IVA or Nigerian industry performance both in the short run and long run, government should put mechanisms in place through financial crime commissions, to monitor what state governments do with bank loans. State government bank loans should be utilized most to fund state industrial activities for industrial and economic expansion. Bank loans should not be embezzled or used to fund politically motivated projects with not much economic bearing.

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APPENDIX SECTION

APPENDIX I:

The annual time series data on Nigerian Industry Value Added (IVA), Bank Loans and Advances to private sector (BLPS), Bank Loans and Advances to Federal Government (BLFG) Bank Loans and Advances to private sector (BLSG)

YEAR	IVA	BLPS	BLFG	BLSG
2000	33.823	429.34	0.78	6.92
2001	28.27627	714.47	5.3	24.91
2002	23.04084	605.31	6.16	16.35
2003	26.00241	1012.37	6.83	19.36

2004	28.39004	1278.64	3.89	22.1
2005	28.20158	1584.52	17.56	50.77
2006	25.75164	2096.27	20.84	72.77
2007	24.34472	4484.48	2.07	69.54
2008	24.71425	6872.69	14.01	129.74
2009	21.23676	7385.76	12.19	292.01
2010	25.31745	6359.62	4.5	354.52
2011	28.2778	6098.51	6.51	497.83
2012	27.1	7036.55	0.92	655.02
2013	25.7	8761.19	0.66	760.15
2014	24.6	11633.02	6.26	530.32
2015	20.2	11656.36	7.79	580.57
2016	18.2	14283.01	0.08	683.32
2017	22.3	14418.06	0.12	896.83
2018	25.7	13908.4	131.45	885.83
2019	27.4	14056.14	92.22	611.68
2020	28.2	13851.83	55.46	610.3
2021	31.4	13382.72	15.37	707.44
2022	30.8	12974.85	0.01	1238.63
2023	31.2	13677.77	0.38	1234.54
2024	31,3	13326.31	0.2	1236.59

APPENDIX 2: Unit Root Test

Null Hypothesis: IVA has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.565163	0.1149
Test critical values:		
1% level	-3.769597	
5% level	-3.004861	
10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(IVA)

Method: Least Squares

Date: 08/05/25 Time: 13:43

Sample (adjusted): 2002 2023

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IVA(-1)	-0.437237	0.170452	-2.565163	0.0189
D(IVA(-1))	0.423120	0.186601	2.267515	0.0352
C	11.42312	4.417460	2.585903	0.0181

R-squared	0.312881	Mean dependent var	0.132897
Adjusted R-squared	0.240552	S.D. dependent var	2.740633
S.E. of regression	2.388360	Akaike info criterion	4.705215
Sum squared resid	108.3810	Schwarz criterion	4.853993
Log likelihood	-48.75736	Hannan-Quinn criter.	4.740262
F-statistic	4.325837	Durbin-Watson stat	1.873955
Prob(F-statistic)	0.028301		

Null Hypothesis: D(IVA) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.807785	0.0092
Test critical values:	1% level	-3.769597	
	5% level	-3.004861	
	10% level	-2.642242	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(IVA,2)

Method: Least Squares

Date: 08/05/25 Time: 13:46

Sample (adjusted): 2002 2023

Included observations: 22 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IVA(-1))	-0.749496	0.196832	-3.807785	0.0011
C	0.167319	0.576504	0.290229	0.7746

R-squared	0.420277	Mean dependent var	0.270306
Adjusted R-squared	0.391291	S.D. dependent var	3.462028
S.E. of regression	2.701068	Akaike info criterion	4.911680
Sum squared resid	145.9154	Schwarz criterion	5.010865
Log likelihood	-52.02848	Hannan-Quinn criter.	4.935045
F-statistic	14.49923	Durbin-Watson stat	1.998824
Prob(F-statistic)	0.001102		

Null Hypothesis: BLPS has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.070311	0.7102
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLPS)

Method: Least Squares

Date: 08/05/25 Time: 13:47

Sample (adjusted): 2001 2024

Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BLPS(-1)	-0.045064	0.042104	-1.070311	0.2961
C	891.4308	397.2922	2.243766	0.0352

R-squared	0.049494	Mean dependent var	537.3738
Adjusted R-squared	0.006289	S.D. dependent var	1081.332
S.E. of regression	1077.926	Akaike info criterion	16.88312
Sum squared resid	25562336	Schwarz criterion	16.98129
Log likelihood	-200.5974	Hannan-Quinn criter.	16.90917
F-statistic	1.145665	Durbin-Watson stat	1.435045
Prob(F-statistic)	0.296082		

Null Hypothesis: D(BLPS) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.385781	0.0223
Test critical values:		
1% level	-3.752946	
5% level	-2.998064	
10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLPS,2)

Method: Least Squares

Date: 08/05/25 Time: 13:49

Sample (adjusted): 2002 2024

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BLPS(-1))	-0.720490	0.212799	-3.385781	0.0028
C	387.3380	257.5862	1.503722	0.1475

R-squared	0.353120	Mean dependent var	-27.67783
Adjusted R-squared	0.322316	S.D. dependent var	1319.830
S.E. of regression	1086.505	Akaike info criterion	16.90226
Sum squared resid	24790342	Schwarz criterion	17.00100
Log likelihood	-192.3760	Hannan-Quinn criter.	16.92709
F-statistic	11.46351	Durbin-Watson stat	1.943136
Prob(F-statistic)	0.002790		

Null Hypothesis: BLFG has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
<hr/>			
Augmented Dickey-Fuller test statistic		-2.663867	0.0949
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLFG)

Method: Least Squares

Date: 08/05/25 Time: 13:51

Sample (adjusted): 2001 2024

Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BLFG(-1)	-0.488186	0.183262	-2.663867	0.0142
C	8.343338	6.530909	1.277516	0.2147

R-squared	0.243887	Mean dependent var		-0.024167
Adjusted R-squared	0.209518	S.D. dependent var		31.55042
S.E. of regression	28.05118	Akaike info criterion		9.585593
Sum squared resid	17311.11	Schwarz criterion		9.683765
Log likelihood	-113.0271	Hannan-Quinn criter.		9.611638
F-statistic	7.096185	Durbin-Watson stat		1.782389
Prob(F-statistic)	0.014181			

Null Hypothesis: D(BLFG) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
<hr/>			
Augmented Dickey-Fuller test statistic		-4.990656	0.0006
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLFG,2)

Method: Least Squares

Date: 08/05/25 Time: 13:53

Sample (adjusted): 2002 2024

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BLFG(-1))	-1.084630	0.217332	-4.990656	0.0001
C	-0.223211	6.856916	-0.032553	0.9743

R-squared	0.542550	Mean dependent var	-0.204348
Adjusted R-squared	0.520767	S.D. dependent var	47.50279
S.E. of regression	32.88461	Akaike info criterion	9.906828
Sum squared resid	22709.35	Schwarz criterion	10.00557
Log likelihood	-111.9285	Hannan-Quinn criter.	9.931660
F-statistic	24.90665	Durbin-Watson stat	2.031760
Prob(F-statistic)	0.000061		

Null Hypothesis: BLSG has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.288989	0.9129
Test critical values:	1% level	-3.737853	
	5% level	-2.991878	
	10% level	-2.635542	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLSG)

Method: Least Squares

Date: 08/05/25 Time: 13:54

Sample (adjusted): 2001 2024

Included observations: 24 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BLSG(-1)	-0.023481	0.081253	-0.288989	0.7753
C	61.95099	48.28875	1.282928	0.2129

R-squared	0.003782	Mean dependent var	51.23625
Adjusted R-squared	-0.041501	S.D. dependent var	148.5115
S.E. of regression	151.5618	Akaike info criterion	12.95952
Sum squared resid	505361.7	Schwarz criterion	13.05769
Log likelihood	-153.5142	Hannan-Quinn criter.	12.98556
F-statistic	0.083514	Durbin-Watson stat	1.779128
Prob(F-statistic)	0.775296		

Null Hypothesis: D(BLSG) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=1)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.182966	0.0038
Test critical values:	1% level	-3.752946	
	5% level	-2.998064	
	10% level	-2.638752	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(BLSG,2)

Method: Least Squares

Date: 08/05/25 Time: 13:55

Sample (adjusted): 2002 2024

Included observations: 23 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BLSG(-1))	-0.910368	0.217637	-4.182966	0.0004
C	47.89764	34.26988	1.397660	0.1768
R-squared	0.454506	Mean dependent var		-0.693043
Adjusted R-squared	0.428530	S.D. dependent var		204.5391
S.E. of regression	154.6227	Akaike info criterion		13.00279
Sum squared resid	502071.5	Schwarz criterion		13.10153
Log likelihood	-147.5321	Hannan-Quinn criter.		13.02763
F-statistic	17.49720	Durbin-Watson stat		1.943915
Prob(F-statistic)	0.000420			

APPENDIX 3: ARDL

Dependent Variable: IVA

Method: ARDL

Date: 08/05/25 Time: 14:00

Sample (adjusted): 2002 2023

Included observations: 22 after adjustments

Maximum dependent lags: 1 (Automatic selection)

Model selection method: Akaike info criterion (AIC)

Dynamic regressors (2 lags, automatic): BLPS BLFG BLSG

Fixed regressors: C

Number of models evaluated: 27

Selected Model: ARDL(1, 0, 2, 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
IVA(-1)	0.166658	0.209021	0.797329	0.4396
BLPS	-0.000799	0.000344	-2.326067	0.0368
BLFG	0.015436	0.017317	0.891358	0.891358
BLFG(-1)	0.027457	0.022520	1.219220	0.2444
BLFG(-2)	0.062901	0.020831	3.019553	0.0099
BLSG	0.004487	0.004079	1.099985	0.2913
BLSG(-1)	0.011549	0.005236	2.205590	0.0460
BLSG(-2)	-0.007215	0.004977	-1.449464	0.1709
C	21.83542	5.848103	3.733762	0.0025
R-squared	0.781267	Mean dependent var		25.82170
Adjusted R-squared	0.646661	S.D. dependent var		3.443241
S.E. of regression	2.046742	Akaike info criterion		4.562464
Sum squared resid	54.45896	Schwarz criterion		5.008799
Log likelihood	-41.18710	Hannan-Quinn criter.		4.667607
F-statistic	5.804132	Durbin-Watson stat		2.169112
Prob(F-statistic)	0.002760			

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

APPENDIX 4: ARDL Long Run Form and Bounds Test

ARDL Long Run Form and Bounds Test

Dependent Variable: D(IVA)

Selected Model: ARDL(1, 0, 2, 2)

Case 2: Restricted Constant and No Trend

Date: 08/05/25 Time: 14:03

Sample: 2000 2024

Included observations: 22

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21.83542	5.848103	3.733762	0.0025
IVA(-1)*	-0.833342	0.209021	-3.986885	0.0015
BLPS**	-0.000799	0.000344	-2.326067	0.0368
BLFG(-1)	0.105794	0.027362	3.866505	0.0019
BLSG(-1)	0.008821	0.005016	1.758617	0.1021
D(BLFG)	0.015436	0.017317	0.891358	0.3889
D(BLFG(-1))	-0.062901	0.020831	-3.019553	0.0099
D(BLSG)	0.004487	0.004079	1.099985	0.2913
D(BLSG(-1))	0.007215	0.004977	1.449464	0.1709

* p-value incompatible with t-Bounds distribution.

** Variable interpreted as $Z = Z(-1) + D(Z)$.

Levels Equation

Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
BLPS	-0.000959	0.000306	-3.133276	0.0079
BLFG	0.126952	0.034541	3.675416	0.0028
BLSG	0.010585	0.004924	2.149952	0.0610
C	26.20224	1.203191	21.77729	0.0000

$$EC = IVA - (-0.0010 \cdot BLPS + 0.1270 \cdot BLFG + 0.0106 \cdot BLSG + 26.2022)$$

F-Bounds Test

Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-statistic	6.576134	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Finite Sample: n=35				
Actual Sample Size	22	10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816
Finite Sample: n=30				
		10%	2.676	3.586
		5%	3.272	4.306

1% 4.614 5.966

APPENDIX 5: ARDL Error Correction Regression

ARDL Error Correction Regression
 Dependent Variable: D(IVA)
 Selected Model: ARDL(1, 0, 2, 2)
 Case 2: Restricted Constant and No Trend
 Date: 08/05/25 Time: 14:05
 Sample: 2000 2024
 Included observations: 22

ECM Regression				
Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(BLFG)	0.015436	0.012826	1.203487	0.2502
D(BLFG(-1))	-0.062901	0.017638	-3.566146	0.0034
D(BLSG)	0.004487	0.003126	1.435447	0.1748
D(BLSG(-1))	0.007215	0.002670	2.702564	0.0181
CointEq(-1)*	-0.833342	0.152348	-5.469998	0.0001
R-squared	0.654738	Mean dependent var		0.132897
Adjusted R-squared	0.573500	S.D. dependent var		2.740633
S.E. of regression	1.789824	Akaike info criterion		4.198827
Sum squared resid	54.45896	Schwarz criterion		4.446792
Log likelihood	-41.18710	Hannan-Quinn criter.		4.257240
Durbin-Watson stat	2.169112			

* p-value incompatible with t-Bounds distribution.

F-Bounds Test				
Null Hypothesis: No levels relationship				
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	6.576134	10%	2.37	3.2
K	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

APPENDIX 6: Breusch-Godfrey Serial Correlation LM Test:

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.796261	Prob. F(2,11)	0.1043
Obs*R-squared	7.415116	Prob. Chi-Square(2)	0.0245

Test Equation:
 Dependent Variable: RESID
 Method: ARDL
 Date: 08/05/25 Time: 14:08
 Sample: 2002 2023
 Included observations: 22
 Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IVA(-1)	0.196344	0.260775	0.752924	0.4673
BLPS	0.000184	0.000323	0.569269	0.5806
BLFG	-0.003984	0.019122	-0.208333	0.8388
BLFG(-1)	0.010461	0.021674	0.482672	0.6388
BLFG(-2)	-0.009248	0.021651	-0.427132	0.6775
BLSG	-0.000775	0.004035	-0.192081	0.8512
BLSG(-1)	0.001425	0.006452	0.220912	0.8292
BLSG(-2)	-0.003368	0.005030	-0.669550	0.5170
C	-5.504646	7.186086	-0.766014	0.4598
RESID(-1)	-0.482336	0.393749	-1.224984	0.2462
RESID(-2)	-0.615265	0.317473	-1.938010	0.0787
R-squared	0.337051	Mean dependent var		4.24E-15
Adjusted R-squared	-0.265630	S.D. dependent var		1.610368
S.E. of regression	1.811667	Akaike info criterion		4.333225
Sum squared resid	36.10353	Schwarz criterion		4.878746
Log likelihood	-36.66548	Hannan-Quinn criter.		4.461734
F-statistic	0.559252	Durbin-Watson stat		1.628005
Prob(F-statistic)	0.815468			

APPENDIX 6: Heteroskedasticity Test: Breusch-Pagan-Godfrey

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.506770	Prob. F(8,13)	0.8308
Obs*R-squared	5.229897	Prob. Chi-Square(8)	0.7327
Scaled explained SS	1.308541	Prob. Chi-Square(8)	0.9954

Test Equation:

Dependent Variable: RESID*2

Method: Least Squares

Date: 08/05/25 Time: 14:11

Sample: 2002 2023

Included observations: 22

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.513578	9.616928	-0.157387	0.8774
IVA(-1)	0.201225	0.343725	0.585424	0.5683
BLPS	0.000133	0.000565	0.235246	0.8177
BLFG	-0.004059	0.028478	-0.142522	0.8889
BLFG(-1)	-0.010297	0.037034	-0.278037	0.7854
BLFG(-2)	0.021546	0.034256	0.628957	0.5403
BLSG	-0.004671	0.006708	-0.696289	0.4985
BLSG(-1)	-0.000466	0.008611	-0.054138	0.9576
BLSG(-2)	0.000196	0.008185	0.023933	0.9813
R-squared	0.237723	Mean dependent var		2.475407
Adjusted R-squared	-0.231371	S.D. dependent var		3.033122
S.E. of regression	3.365769	Akaike info criterion		5.557279
Sum squared resid	147.2692	Schwarz criterion		6.003614
Log likelihood	-52.13007	Hannan-Quinn criter.		5.662422
F-statistic	0.506770	Durbin-Watson stat		1.845116
Prob(F-statistic)	0.830843			